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ERRATA

NSA, Vol. 5, No. 20, page 822. The report number of abstract 5744 has been changed from (NP-3314) to (AECU-1939).

NSA, Vol. 5, No. 24, page 1260. Journal reference for AECU-656 should be Rev. Sci. Instruments 22, 697(1951).

NSA, Vol. 5, No. 24, page 1266. Journal reference for AECU-1505 should be J. Am. Chem. Soc. 74, 318-22(1952).

NSA, Vol. 6, No. 6A, page i. In Table of Contents, the word Aerosols, immediately below CHEMISTRY, and the associated number 1624 should be deleted.

NSA, Vol. 6, No. 6A, page 208. The word AEROSOLS immediately above abstract 1624 should be deleted.

REPORTS REFERENCE LIST

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The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

U. S. ATOMIC ENERGY COMMISSION DECLASSIFIED REPORTS

AECD-3324 2799
Los Alamos Scientific Lab.
LOW TEMPERATURE THERMAL EXPANSION OF URANIUM, by Adam F. Schuch and Henry L. Laquer. [nd] Decl. Mar. 26, 1952. 4p. (AECD-3324; LADC-1124)

AECD-3325 2713
Westinghouse Atomic Power Div.
FEASIBILITY STUDY OF A NEUTRON FLUX BOLOMETER, by Robert R. Leonard. Sept. 5, 1951. Decl. Mar. 24, 1952. 37p. (AECD-3325; WAPD-5(Rev.))

AECD-3326 2772
Westinghouse Atomic Power Div.
THE CONDUCTIVITY CHANGE IN POLYETHYLENE DURING γ-IRRADIATION, by S. Mayburg and W. L. Lawrence. Jan. 2, 1952. Decl. Mar. 25, 1952. 26p. (AECD-3326; WAPD-48)

AECD-3327 2632
Argonne National Lab.
STUDIES OF THE SOLVENT EXTRACTION BEHAVIOR OF THE TRANSITION ELEMENTS; I. FRACTIONATION OF THE TRIVALENT RARE EARTHS, by D. F. Peppard, J. P. Faris, P. R. Gray and G. W. Mason. Jan. 17, 1952. Decl. Mar. 21, 1952. 48p. (AECD-3327; ANL-WMM-927)

AECD-3328 2644
Argonne National Lab.
SPECTROPHOTOMETRIC DETERMINATION OF URANIUM BY THIOCYANATE METHOD IN ACETONE MEDIUM, by Carl E. Crouthamel and Carl E. Johnson. Feb. 1952. Decl. Mar. 21, 1952. 16p. (AECD-3328; ANL-HDY-701)

AECD-3329 2617
Oak Ridge National Lab., Y-12 Area
PREPARATION OF ZIRCONIUM TETRAFLUORIDE; PROGRESS REPORT I, by J. L. Williams and Boyd S. Weaver. June 15, 1950. Decl. with deletions Mar. 25, 1952. 16p. (AECD-3329; Y-619)

AECD-3330 2708
Westinghouse Atomic Power Div.
AN ANTICOINCIDENCE GAMMA RAY SCINTILLATION SPECTROMETER, by Richard D. Albert. September 1951. Decl. Mar. 28, 1952. 29p. (AECD-3330; WAPD-42)

AECD-3331 2759
Oak Ridge National Lab.
THE PREPARATION OF THIN AND OF THICK TARGETS TO BE BOMBARDED BY POSITIVE PARTICLES, by Rene A. Bolomey. Issued Jan. 9, 1952. Decl. Mar. 24, 1952. 24p. (AECD-3331; ORNL-1163)

AECD-3332 2771
Westinghouse Atomic Power Div.
THE RESISTIVITY OF Cu$_3$Au DURING NEUTRON IRRADIATION, by H. L. Glick, F. C. Brooks, W. F. Witzig, and W. E. Johnson. Feb. 26, 1952. Decl. Mar. 28, 1952. 5p. (AECD-3332; WAPD-T-7)

AECD-3333 2604
Battelle Memorial Inst.
THE DETERMINATION OF HYDROGEN IN MAGNESIUM, LITHIUM, AND MAGNESIUM ALLOYS, by M. W. Mallett, A. F. Gerds, and C. B. Griffith. Nov. 13, 1951. 21p. Decl. Mar. 21, 1952. (AECD-3333; BMI-708)

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Battelle Memorial Inst.
ELECTROPLATING ON ZIRCONIUM, by W. C. Schickner, J. G. Beach, and C. L. Faust. Nov. 15, 1951. Decl. Mar. 24, 1952. 27p. (AECD-3334; BMI-707)

AECD-3335 2640
Oak Ridge National Lab., Y-12 Area
PREPARATION OF ZIRCONIUM TETRAFLUORIDE; PROGRESS REPORT II, by Joe L. Williams. Feb. 15, 1951. Decl. with deletions Mar. 24, 1952. 14p. (AECD-3335; Y-769)

AECD-3336 2689
Argonne National Lab.
THE CRYSTAL STRUCTURE OF NEPTUNIUM METAL, by W. H. Zachariasen. Argonne National Lab. and Univ. of Chicago. Jan. 22, 1952. Decl. Mar. 24, 1952. 11p. (AECD-3336; ANL-FWHZ-199)

AECD-3337 2701
Radiation Lab., Univ. of Calif.
A TIME OF FLIGHT MASS SPECTROGRAPH (thesis), by William Ellis Glenn, Jr. Jan. 8, 1952. Decl. Mar. 6, 1952. 71p. (AECD-3337; UCRL-1628)

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Oak Ridge National Lab.
RADIOCHEMICAL PILOT PLANT DEVELOPMENT AT THE OAK RIDGE NATIONAL LABORATORY, by H. K. Jackson and J. W. Ullmann. Feb. 4, 1952. Decl. Mar. 13, 1952. 22p. (AECD-3338; CF-52-2-19)

AECD-3339 2634
Los Alamos Scientific Lab.
OBSERVATIONS ON CURIUM VALENCE STATES; A RAPID SEPARATION OF AMERICIUM AND CURIUM, by S. E. Stephanou and R. A. Penneman. Feb. 4, 1952. Decl. Mar. 26, 1952. 5p. (AECD-3339; LADC-1114)

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AN AUTOMATIC TITRATOR USING ELECTROLYTICALLY GENERATED TITRANTS, by W. N. Carson, Jr. Dec. 3,

1951. Decl. with deletions Mar. 24, 1952. 31p. (AECD-3343; HW-22780)

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THE TEMPERATURE DEPENDENCE OF THE SOLUBILITY OF SOLID NONELECTROLYTES, by J. H. Hildebrand. [nd] 5p. (AECU-1925)

AECU-1927 2553
Sloan-Kettering Inst. for Cancer Research
THE INCORPORATION OF FORMATE INTO PENTOSENUCLEIC ACIDS IN VARIOUS ORGANS OF THE RAT, by Pierre Drochmans, Denis H. Marrian, and George Bosworth Brown. [nd] 15p. (AECU-1927)

AECU-1928 2677
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AN INVESTIGATION OF THE MAGNETIC PROPERTIES OF LIQUID HE^3, by E. F. Hammel, H. L. Laquer, S. G. Sydoriak and W. E. McGee. [nd] 3p. (AECU-1928; LADC-1112)

AECU-1929 2781
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BACTERIAL SYNTHESIS OF ALANINE AND GLUTAMATE, by Eric B. Fowler and C. H. Werkman. [nd] 11p. (AECU-1929)

AECU-1930 2776
Argonne National Lab.
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Argonne National Lab.
PROPOSAL FOR A LENS TYPE PAIR SPECTROMETER, by Melvin S. Freedman. Mar. 1952. 4p. (AECU-1931; UAC-522)

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THE PERMEABILITY OF THE HUMAN ERYTHROCYTE TO SODIUM AND POTASSIUM, by A. K. Solomon. [nd] 82p. (AECU-1932)

AECU-1933 2737
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METHODS FOR MEASURING FAST NEUTRON CROSS SECTIONS, by H. H. Barschall. [nd] 45p. (AECU-1933; LADC-1135)

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PROGRESS REPORT ON THE BEHAVIOR OF ORGANIC COMPOUNDS AT THE DROPPING MERCURY ELECTRODE IN NON-ASSOCIATED ANHYDROUS SOLVENTS, by Stanley Wawzonek, Reynold A. Berkey, Eli. W. Blaha and Francis D. Thomson. Mar. 21, 1952. 16p. (AECU-1934)

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INTERNAL CONVERSION IN I^{131}, by David Rose. Dec. 15, 1951. 85p. (AECU-1935)

AECU-1936 2666
Cornell Aeronautical Lab., Inc.
FINAL REPORT ON HIGH TEMPERATURE TESTING OF TYPE 316 STAINLESS STEEL SHEET; NOVEMBER 1, 1950 TO JUNE 29, 1951, by G. J. Guarnieri. June 29, 1951. 38p. (AECU-1936)

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THE STABILITY OF SOME QUATERNARY AMMONIUM POLYHALIDES IN ETHYLENE CHLORIDE, by Robert E. Buckles, Alexander I. Popov, James P. Yuk and Jack F. Mills. [nd] 25p. (AECU-1937)

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RCA Labs. Div., Radio Corp. of America
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AECU-1940 2691
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CHRONIC EXTERNAL IRRADIATION; NEUTRON TOXICITY, AND HEMATOLOGY, p.9-47 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT; AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 39p. (ANL-4713(p.9-47))

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PHARMACOLOGY; THEORETICAL BIOLOGY, EXPERIMENTAL PATHOLOGY, AND TREATMENT OF POSTIRRADIATION INFECTION WITH ANTIBIOTICS, p.109-24 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 16p. (ANL-4713(p.109-24))

BNL-1120 2707
Brookhaven National Lab.
PARTICLE LOCALIZATION BY MEANS OF A SCINTIL-

LATION DETECTOR, by Luke C. L. Yuan and H. L. Poss. Feb. 29, 1952. 10p. (BNL-1120)

BNL-1121 2778
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DECAY OF Sr^{85} AND Sr^{85m}, by A. W. Sunyar, J. W. Mihelich, G. Scharff-Goldhaber, M. Goldhaber, N. S. Wall, and M. Deutsch. Brookhaven National Lab. and Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech. [nd] 21p. (BNL-1121)

BNL-1126 2621
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ISOTOPIC EXCHANGE BETWEEN THE VALENCE STATES OF MERCURY, by Richard L. Wolfgang and Richard W. Dodson. [nd] 28p. (BNL-1126)

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THE IONIZATION CONSTANTS AT 50° OF META-AND PARA-IODOXYBENZOIC ACIDS, by Aksel A. Bothner-By and Avrom I. Medalia. [nd] 13p. (BNL-1135)

CF-52-3-219 2793*
Oak Ridge National Lab.
TRANSFORMATION FROM DISC TO POINT SOURCE GEOMETRY, by E. P. Blizard. Mar. 27, 1952. 3p. (CF-52-3-219)

COO-87 2557
Air Force Radiation Lab., Univ. of Chicago
[RESEARCH ON THE BIOLOGICAL AND MEDICAL ASPECTS OF ATOMIC ENERGY.] QUARTERLY PROGRESS REPORT NO. 2. Jan. 15, 1952. 81p. (COO-87; Quarterly Progress Report No. 2; U21326)

ISC-196 2595
Ames Lab.
SPECTROPHOTOMETRIC INVESTIGATIONS OF SOME COMPLEXES OF RUTHENIUM. IV. RUTHENIUM REACTIONS WITH 4-PHENYLTHIOSEMICARBAZIDE AND DIPHENYLTHIOCARBAZIDE, by Ruth Powers Yaffe and Adolf F. Voigt. Mar. 25, 1952. 10p. (ISC-196)

ISC-198 2680
Ames Lab.
THERMAL CONDUCTIVITY OF METALS AT HIGH TEMPERATURES, by Paul H. Sidles and G. C. Danielson. Dec. 1951. (ISC-198)

KAPL-668 2653
Knolls Atomic Power Lab.
OPERATION AND ANALYSIS OF A 100-PSI ELECTROMAGNETIC PUMP, by G. D. Collins. Jan. 19, 1952. 74p. (KAPL-668)

LA-1371 2751
Los Alamos Scientific Lab.
(n,2n) CROSS SECTION OF Be^{9}, by Harold M. Agnew. Feb. 19, 1952. 7p. (LA-1371)

NEPA-1799 2695
NEPA Div.. Fairchild Engine and Airplane Corp.
AN IMPULSE TYPE RESISTANCE WELDER, by E. R. Mann. Apr. 10, 1951. 8p. (NEPA-1799)

NEPA-1848 2655
Massachusetts Inst. of Tech.
FINAL REPORT ON DEVELOPMENT OF METAL-CERAMIC COMPOSITIONS SUITABLE FOR SERVICE AT ELEVATED TEMPERATURES, by W. D. Kingery, G. Economos, M. Humenik, Jr., and M. Berg. Apr. 30, 1951. 54p. (NEPA-1848)

NYO-828 2667
Metals Research Lab., Carnegie Inst. of Tech.
ELECTROCHEMICAL STUDIES OF NON-AQUEOUS MELTS; QUARTERLY PROGRESS REPORT PERIOD ENDING FEBRUARY 15, 1952. Mar. 28, 1952. (NYO-828)

NYO-913 2779
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DOUBLE BETA-DECAY, by Rolf G. Winter. Sept. 1, 1951. 70p. (NYO-913)

NYO-1640 2579
Atomic Energy Project, Western Reserve Univ.
THE DETERMINATION OF CARDIAC OUTPUT BY A CONTINUOUS RECORDING SYSTEM UTILIZING IODINATED (I^{131}) HUMAN SERUM ALBUMIN; CLINICAL STUDIES, by Walter H. Pritchard, William J. MacIntyre, William C. Schmidt, Bernard L. Brofman and Douglas J. Moore. [nd] 22p. (NYO-1640)

NYO-1643 2559
Atomic Energy Project, Western Reserve Univ.
MONTHLY PROGRESS REPORT JANUARY 1952, by Hymer L. Friedell. [nd] 11p. (NYO-1643)

NYO-3260 2620
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THE RADIATION DECOLORIZATION OF DILUTE DYE SOLUTIONS; CHLOROPHENOL RED, by Edward N. Weber and Robert H. Schuler. Feb. 1952. 19p. (NYO-3260)

NYO-3298 2776
Carnegie Inst. of Tech.
ALPHA-GAMMA COINCIDENCES AND ANGULAR CORRELATION IN Po^{210}, by George H. Minton. Feb. 20, 1952. 50p. (NYO-3298)

NYO-3317 2569
Columbia Univ.
QUARTERLY PROGRESS REPORT; FOOD IRRADIATION AND ASSOCIATED STUDIES, by Elmer L. Gaden, Jr. Dec. 1, 1951. 16p. (NYO-3317)

NYO-3396 2685
Syracuse Univ.
HIGH-ENERGY NUCLEAR INTERACTIONS IN LEAD, by Fritz E. Froehlich, Erich M. Harth and Kurt Sitte. Feb. 29, 1952. 51p. (NYO-3396)

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Oak Ridge National Lab., Y-12 Area
THE NUCLEAR GYROMAGNETIC RATIO OF V^{50} AND MEASUREMENTS ON Rb^{85} AND Cl^{35}, by H. E. Walchli, W. E. Leyshon and F. M. Scheitlin. Jan. 29, 1952. 16p. (ORNL-1239)

ORO-61 2596
Florida State Univ.
[EXCHANGE BETWEEN LABELLED HALOGENS AND CERTAIN INORGANIC HALIDES.] PROGRESS REPORT, by Rowland E. Johnson. [nd] 9p. (ORO-61)

TID-4005 2252
Atomic Energy Commission
SUMMARIES OF UNCLASSIFIED BASIC RESEARCH PROJECTS IN THE PHYSICAL SCIENCES. [nd] (TID-4005)

UCLA-189 2711
Atomic Energy Project, Univ. of Calif.
A NEW PLASTIC TAPE FILM BADGE HOLDER, by Arturo Frisoli and Louis B. Silverman. Issued Mar. 24, 1952. 11p. (UCLA-189)

UCRL-1614 2556
Radiation Lab., Univ. of Calif.
THE VIABILITY OF HETEROZYGOTES FOR LETHALS, by C. Stern, G. Carson, M. Kinst, E. Novitski, and D. Uphoff. Dec. 1951. 68p. (UCRL-1614)

UCRL-1658 2580
Radiation Lab., Univ. of Calif.
THE PATH OF CARBON IN PHOTOSYNTHESIS; XVI. KINETIC RELATIONSHIPS OF THE INTERMEDIATES IN STEADY STATE PHOTOSYNTHESIS, by S. Kawaguchi, A. A. Benson and M. Calvin. Feb. 5, 1952. 22p. (UCRL-1658)

UCRL-1681 2775
Radiation Lab., Univ. of Calif.
THE COMPLEX ALPHA SPECTRA OF AM^{241} AND Cm^{242}, by Frank Asaro, F. L. Reynolds, and I. Perlman. Feb. 16, 1952. 34p. (UCRL-1681)

UCRL-1684 2578
Radiation Lab., Univ. of Calif.
RADIOACTIVE EGGS. III. DEGRADATION OF YOLK GLYCEROL, by David Kritchevsky and S. Abraham. Feb. 21, 1952. 9p. (UCRL-1684)

UCRL-1685 2570
Radiation Lab., Univ. of Calif.
USE OF A GAMMA RAY PINHOLE CAMERA FOR IN-VIVO STUDIES, by H. O. Anger. Feb. 21, 1952. 6p. (UCRL-1685)

UCRL-1692 2721
Radiation Lab., Univ. of Calif.
FAST MESON INTERACTIONS IN NUCLEAR EMULSIONS; PART II. ON π^+ MESONS, by Bayard Rankin and Hugh Bradner. Feb. 25, 1952. 20p. (UCRL-1692)

UCRL-1695 2674
Radiation Lab., Univ. of Calif.
NOTE ON THE STABILITY OF LINEAR FEEDBACK SYSTEMS, by E. T. Jaynes. Feb. 27, 1952. 10p. (UCRL-1695)

UR-185 2560
Atomic Energy Project, Univ. of Rochester
SPERMATOGENES IN THE ADULT ALBINO RAT AS REVEALED BY TISSUE SECTIONS IN THE ELECTRON MICROSCOPE, by Michael L. Watson. Jan. 21, 1952. 127p. (UR-185)

WAPD-T-4 2664
Westinghouse Atomic Power Div.
THE SPECTROGRAPHIC ANALYSIS OF 18-8 STAINLESS STEEL FOR COBALT, MANGANESE AND STABILIZING ELEMENTS, by Neil E. Gordon, Jr., Ralph M. Jacobs and Marilyn C. Rickel. Jan. 11, 1952. 15p. (WAPD-T-4)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

ACSIL/Liby-8 2693*
Admiralty Centre for Scientific Information and Liaison, London (England)
BIBLIOGRAPHY OF PUBLISHED REFERENCES TO SERVOMECHANISMS AND ASSOCIATED DEVICES. H. L. R. Hinkley, comp. Nov. 1951. 58p. (ACSIL/Liby-8)

AERE-C/M-127 2587
[Atomic Energy Research Establishment, Harwell, Berks (England)]
NOTE ON THE INVESTIGATION OF ALUMINA BY MEANS OF THE HAHN EMANATION TECHNIQUE AND X-RAY MEASUREMENTS, by S. Moorbath. [nd] 4p. (AERE-C/M-127)

AERE-C/M-129 2770
[Atomic Energy Research Establishment, Harwell, Berks (England)]
THE EFFECT OF PILE IRRADIATION ON THE EMANATING POWER OF ALUMINA, by J. N. Gregory and S. Moorbath. [nd] 4p. (AERE-C/M-129)

AERE EL/R-805 2709
Atomic Energy Research Establishment, Harwell, Berks (England)
A NEW BASE, SOCKET AND NEOPRENE PROTECTOR FOR G.M. COUNTER TUBES, by F. Wade. Oct. 18, 1951. (AERE EL/R-805)

AERE E/R-817 2654
Atomic Energy Research Establishment, Harwell, Berks (England)
THE EFFECT OF FRICTION ON THE FLOW IN VANELESS DIFFUSOR SPACE OF CENTRIFUGAL COMPRESSORS, by J. Woodrow. January 1952. 13p. (AERE E/R-817)

AERE I/R-822 2635
Atomic Energy Research Establishment, Harwell, Berks (England)
A ROCKING AUTOCLAVE FOR THE EXTRACTION OF PHOSPHORUS 32 FROM PILE-IRRADIATED SULPHUR AT THE CURIE LEVEL OF ACTIVITY, by W. J. Arrol. Nov. 12, 1951. 8p. (AERE I/R-822)

AERE MED/R-823 2554*
Atomic Energy Research Establishment, Harwell, Berks (England)
A BLOOD FILM SPREADING MACHINE, by K. C. Parry and R. H. Brown. Dec. 6, 1951. 5p. (AERE MED/R-823)

AERE M/R-744 2613
Atomic Energy Research Establishment, Harwell, Berks (England)
THE PREPARATION OF URANIUM CRYSTALS, by R. W. Cahn. Nov. 12, 1951. 22p. (AERE M/R-744)

AERE T/M-57 2732
[Atomic Energy Research Establishment, Harwell, Berks (England)]
A SEMICIRCULAR WAVEGUIDE LOADED BY A SEMICIRCULAR SLOTTED SHEET, by J. S. Bell and J. M. Bruce. [nd] 8p. (AERE T/M-57)

AERE-T/R-858 2731
Atomic Energy Research Establishment, Harwell, Berks (England)
GROUP VELOCITY AND ENERGY VELOCITY IN PERIODIC WAVEGUIDES, by J. S. Bell. 1952. 5p. (AERE-T/R-858)

AF-TR-6586 2373*
Wright Air Development Center
LINEAR NOISE SMOOTHING AND PREDICTING FILTERS, by Frank W. Bubb. May 1951. 28p. (AF-TR-6586)

AMRL-71 2561
Army Medical Research Lab.
EFFECT OF TOTAL BODY X-IRRADIATION ON THE PLASMIN INHIBITOR TITER IN THE BLOOD OF RATS, by Walter Kocholaty, William W. Ellis and Hans F. Jensen. Dec. 15, 1951. 6p. (AMRL-71)

AMRL-72 2605
Army Medical Research Lab.
THE INFLUENCE OF VISIBLE LIGHT ON THE SULFHYDRYL CONTENT OF YEAST CELLS AFTER IONIZING AND ULTRAVIOLET IRRADIATION, by Walter Kocholaty and Jack Denson. Dec. 15, 1951. 11p. (AMRL-72)

AMRL-73 2624
Army Medical Research Lab.
THE EFFECT OF ULTRAVIOLET RADIATION ON SULFHYDRL AND DISULFIDE CONTAINING AMINO ACIDS, by Klaus Schocken. Jan. 2, 1952. 5p. (AMRL-73)

NACA-RM-E51I10 2656
Lewis Flight Propulsion Lab., NACA
ELEVATED TEMPERATURE PROPERTIES OF TITANIUM CARBIDE BASE CERAMALS CONTAINING NICKEL OR IRON, by A. L. Cooper and L. E. Colteryahn. Dec. 3, 1951. 47p. (NACA-RM-E51I10

NACA-RM-E51I18 2649
Lewis Flight Propulsion Lab., NACA
FORCED-CONVECTION HEAT TRANSFER TO WATER AT HIGH PRESSURES AND TEMPERATURES IN THE NON-BOILING REGION, by S. J. Kaufman and R. W. Henderson. Nov. 29, 1951. 16p. (NACA-RM-E51I18)

NACA-RM-E51L20 2672
Lewis Flight Propulsion Lab., NACA
FRICTION AND SURFACE DAMAGE OF SEVERAL CORROSION-RESISTANT MATERIALS, by Marshall B. Peterson and Robert L. Johnson. Feb. 20, 1952. 20p. (NACA-RM-E51L20)

NACA-TN-1952 2761
Lewis Flight Propulsion Lab., NACA
ANALYTICAL METHOD FOR DETERMINING TRANSMISSION AND ABSORPTION OF TIME-DEPENDENT RADIATION THROUGH THICK ABSORBERS. II. SOURCE INTENSITY, TIME-DEPENDENT, by G. Allen. September 1949. 11p. (NACA-TN-1952)

NACA-TN-2108 2773*
Lewis Flight Propulsion Lab., NACA
ANALYTICAL METHOD FOR DETERMINING TRANSMISSION AND ABSORPTION OF TIME-DEPENDENT RADIATION THROUGH THICK ABSORBERS. III. ABSORBER WITH RADIOACTIVE DAUGHTER PRODUCTS, by G. Allen. June 1950. 17p. (NACA-TN-2108)

NACA-TN-2628 2599
Lewis Flight Propulsion Lab., NACA
BONDING OF MOLYBDENUM DISULFIDE TO VARIOUS MATERIALS TO FORM A SOLID LUBRICATING FILM. I. THE BONDING MECHANISM, by Douglas Godfrey and Edmond E. Bisson. Feb. 1952. 16p. (NACA-TN-2628)

NBS-1388 2696
National Bureau of Standards
ELECTRICAL NOISE FROM INSTRUMENT CABLES SUBJECTED TO SHOCK AND VIBRATION, by Thomas A. Perls. Jan. 1952. 22p. (NBS-1388)

NBS-1406 2592
National Bureau of Standards
THE HEAT CAPACITY OF LITHIUM FLUORIDE FROM 0° TO 900°C; THE MELTING POINT AND HEAT OF FUSION, by Thomas B. Douglas and James L. Dever. Jan. 10, 1952. 27p. (NBS-1406)

NBS-1435 2616
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF DIATOMIC FLUORINE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Feb. 1, 1952. 21p. (NBS-1435; U21189)

NP-3088 2676*
Vibration Research Lab., Stanford Univ.
RESPONSE OF A YIELDING VIBRATORY SYSTEM TO TRANSIENT FORCING FUNCTIONS (I); SINGLE-DEGREE-OF-FREEDOM SYSTEMS; STEM-WISE FORCING FUNCTIONS; PHASE-PLANE GRAPHICAL METHOD. Mar. 20, 1951. 34p. (NP-3088; Technical Report No. 11)

NP-3148 2657*
Corrosion Research Lab., Ill. Inst. of Tech.
THEORY OF CORROSION INHIBITOR ACTION, by Hugh J. McDonald, Glenn A. Marsh and Robert D. Misch. June 1948. 40p. (NP-3148; U1597)

NP-3149 2588*
Illinois Inst. of Tech.
THE REACTIONS OF METALS WITH GASES AND SALTS AT HIGH TEMPERATURES; THE KINETICS OF THE REACTION OF GERMANIUM AND OXYGEN, by Richard B. Bernstein and Daniel Cubicciotti. Oct. 1950. 13p. (NP-3149; Technical Report No. 9)

NP-3153 2647*
Stanford Univ.
GAS TURBINE REGENERATOR DESIGN STUDIES, by W. M. Kays and A. L. London. Dec. 15, 1949. 39p. (NP-3153; Technical Report No. 8)

NP-3154 2648
Stanford Univ.
THE HEAT TRANSFER AND FLOW FRICTION PERFORMANCE OF THREE COMPACT PLATE-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Dec. 1, 1949. 40p. (NP-3154; Technical Report No. 7; U21185)

NP-3155 2650
Stanford Univ.
THE PERFORMANCE OF FINNED-CIRCULAR-TUBE HEAT EXCHANGER SURFACES, by D. W. Johnson. Jan. 1, 1951. 22p. (NP-3155; Technical Report No. 12)

NP-3156 2678*
University of Southern Calif.
PROPERTIES OF SOLUTIONS IN THE NEIGHBORHOOD OF THE CRITICAL TEMPERATURE OF THE SOLVENT; SECOND TECHNICAL REPORT PHYSICAL SCIENCES DIVISION; COVERING PERIOD APRIL 1, 1950 - JANUARY 31, 1951, by Sidney W. Benson, Charles S. Copeland, Donald W Fisher, James K. Fogo and Jacob Silverman. March 1, 1951. 57p. (NP-3156)

NP-3167 2651
Massachusetts Inst. of Tech.
SHEAR FLOW IN BENDS, by W. R. Hawthorne and Hans P. Eichenberger. Mar. 1, 1951. 7p. (NP-3167; Technical Report No. 1)

NP-3589 2679
Bell Telephone Labs., Inc.
THE TRANSISTOR; SELECTED REFERENCE MATERIAL ON CHARACTERISTICS AND APPLICATIONS. [nd] 792p. (NP-3589)

NP-3615 2753
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
MEASUREMENTS OF NUCLEAR DISINTEGRATION ENERGIES OF LIGHT NUCLEI, by D. M. Van Patter. Jan. 15, 1952. 53p. (NP-3615; Technical Report No. 57; U20838)

NP-3632 2662
Fansteel Metallurgical Corp.
DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS; SIX MONTHS' INTERIM TECHNICAL PROGRESS REPORT; MAY 18, 1951 THROUGH NOVEMBER 30, 1951, by Stanley Kluz and Ralph Wehrmann. Dec. 26, 1951. 15p. (NP-3632)

NP-3636 2591
Cryogenic Lab., Ohio State Univ.
THE HEAT CAPACITY OF BETA-GALLIUM OXIDE FROM

15° TO 300°K, by George B. Adams, Jr. and Herrick L. Johnston. [nd] 10p. (NP-3636; TR-283-14; U20892)

NP-3638 2590
Colorado Univ.
LUMINESCENCE SPECTRA OF ORGANIC COMPOUNDS; FINAL REPORT FOR THE CONTRACT PERIOD JANUARY 1, 1950 TO DECEMBER 30, 1951. [nd] 66p. (NP-3638; U21055)

NP-3641 2665
California Inst. of Tech.
DELAYED YIELDING IN ANNEALED MILD STEEL WITH SPECIAL REFERENCE TO YIELDING AT LOW TEMPERATURES; FOURTH TECHNICAL REPORT, by D. S. Wood and D. S. Clark. December 1951. 29p. (NP-3641; U21000)

NP-3642 2558
Air Univ. School of Aviation Medicine
EFFECT OF WHOLE BODY X-RADIATION AND OF INTRAPERITONEAL HYDROGEN PEROXIDE ON A NUCLEOPROTEIN-CONTAINING FRACTION OF RAT INTESTINE AND ON WHOLE RAT INTESTINE, by Robert N. Feinstein and Carrie L. Butler. Nov. 1951. 7p. (NP-3642; U21021)

NP-3653 2637
Engineering Research Inst., Univ. of Mich.
INTERIM REPORT NO. 1; SPECTROCHEMICAL ANALYSIS OF TITANIUM METAL AND ALLOYS, by J. H. Enns. November 1951. 21p. (NP-3653)

NP-3665 2684
Engineering Research Inst., Univ. of Mich.
BURST PRODUCTION IN MATERIAL OF Z-11 BY COSMIC RAYS AT SEA LEVEL, by Frank E. Driggers. November 1951. 101p. (NP-3665; U21200)

NP-3666 2683
Engineering Research Inst., Univ. of Mich.
THE PRODUCTION OF HIGH-ENERGY SECONDARIES BY COSMIC RAYS UNDERGROUND, by W. E. Hazen. Nov. 30, 1951. 8p. (NP-3666; U21198)

NP-3672 2589
Cryogenic Lab., Ohio State Univ.
THE HEAT CAPACITY OF GALLIUM FROM 15° TO 320° K; THE HEAT OF FUSION AT THE MELTING POINT, by George B. Adams, Jr., Herrick L. Johnston, and Eugene C. Kerr. [nd] 20p. (NP-3672; Technical Report No. 15; U21185)

NP-3673 2663
Illinois Univ. Engineering Experiment Station
AN ELECTRON MICROSCOPE STUDY OF THE DEVELOPMENT OF FATIGUE FAILURES, by W. J. Craig. Feb. 1952. 22p. (NP-3673; Technical Report No. 27; U21182)

NP-3690 2568
Air Univ. School of Aviation Medicine
EFFECT OF IRRADIATION ON P^{32} UPTAKE BY BONE MARROW AND SPLEEN. I. NORMAL VALUES AND THE EFFECT OF SODIUM PENTOBARBITAL, by W. A. Rambach, D. A. Moomaw, H. L. Alt and J. A. D. Cooper. Apr. 1952. 6p. (NP-3690)

NP-3698 2584
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 104p. (NP-3698)

NP-3698(p.1-23) 2585
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
CHEMISTRY OF THE FISSION ELEMENTS GROUP, COSMIC RAY GROUP AND ELEMENTARY PARTICLE SCATTERING GROUP, p.1-23 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 23p. (NP-3698(p.1-23))

NP-3698(p.24-43) 2586
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
M.I.T.-O.N.R. GENERATOR CONSTRUCTION AND HIGH VOLTAGE GROUP AND NUCLEAR CHEMISTRY (INORGANIC) GROUP, p.24-43 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 20p. (NP-3698(p.24-43))

NP-3698(p.44-53) 2752
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
NUCLEAR CHEMISTRY (ORGANIC) GROUP AND ONR GENERATOR GROUP, p.44-53 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 10p. (NP-3698(p.44-53))

NP-3698(p.54-96) 2710
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
RADIOACTIVITY AND CYCLOTRON GROUP, SYNCHROTRON GROUP AND THEORETICAL GROUP, p.54-96 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 43p. (NP-3698 (p.54-96)

NP-3699 2669
Battelle Memorial Inst.
INVESTIGATION OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS MADE BY POWDER-METALLURGY TECHNIQUES; SUMMARY REPORT, by W. L. Bruckart, M. H. LaChance, C. M. Craighead and R. I. Jaffee. June 30, 1951. (NP-3699)

R52GL50 2646
General Engineering Lab., General Electric Co.
ANALYSIS OF JOURNAL BEARING THEORY AND TEST RESULTS, by Harry Apkarian. Mar. 1, 1952. 29p. (R52GL50)

R52GL52 2645
General Engineering Lab., General Electric Co.
DEVELOPMENT OF SLEEVE BEARING TEST EQUIPMENT, by Harry Apkarian. Mar. 1, 1952. 14p. (R52GL52)

VTO/M/208 2668
Vickers—Armstrongs, Ltd. (England)
THE EFFECT OF GRAIN DIRECTION ON THE MECHANICAL PROPERTIES OF LIGHT ALLOY EXTRUSIONS, by D. M. McElhinney. [nd] 64p. (VTO/M/208; S and T Memo No. 14/51)

NUCLEAR SCIENCE ABSTRACTS

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GENERAL

RESEARCH PROGRAMS

2552

Atomic Energy Commission

SUMMARIES OF UNCLASSIFIED BASIC RESEARCH PROJECTS IN THE PHYSICAL SCIENCES. [nd] (TID-4005)

A summary is presented of unclassified basic research projects in certain fields of the physical sciences related to atomic energy which are at present being conducted or have been concluded at universities and other independent research institutions under sponsorship of AEC. This directory contains summaries of the scope of the research being conducted under each contract in the four fields of chemistry, metallurgy, physics, and mathematics. A Senior Investigator Index and a Contract Number Index are included.

BIOLOGY AND MEDICINE

2553

Sloan-Kettering Inst. for Cancer Research

THE INCORPORATION OF FORMATE INTO PENTOSENUCLEIC ACIDS IN VARIOUS ORGANS OF THE RAT, by Pierre Drochmans, Denis H. Marrian, and George Bosworth Brown. [nd] 15p. (AECU-1927)

The incorporation of formate into pentosenucleic acids in various organs of the rat was investigated after injection of C^{14}-labeled formate. The relative incorporation of formate into the purine ribonucleotides of various organs was found to be greatest in the intestine, followed in order by kidney, spleen, liver, pancreas, and testis. The renewal of the PNA-adenine was greater than that of guanine in all organs except spleen, and no differentiation was found between the isomeric purine nucleotides.

2554

Atomic Energy Research Establishment, Harwell, Berks (England)

A BLOOD FILM SPREADING MACHINE, by K. C. Parry and R. H. Brown. Dec. 6, 1951. 5p. (AERE MED/R-823)

2555

Argonne National Lab.

DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 133p. (ANL-4713)

Separate abstracts have been prepared on the following sections of this report: Chronic External Irradiation, Neutron Toxicity, and Hematology, p.9-47; Physiology, Radium Toxicity, Histopathology, and Radiochemistry, p.48-73; Special Problems, p.74-86; Invertebrate Zoology, Phytoradiobiology, and Microbiology, p.87-100; Biochemistry and Physiological Chemistry, p.101-5; and Pharmacology, Theoretical Biology, Experimental Pathology, and Treatment of Postirradiation Infection with Antibiotics, p.109-24.

2556

Radiation Lab., Univ. of Calif.

THE VIABILITY OF HETEROZYGOTES FOR LETHALS, by C. Stern, G. Carson, M. Kinst, E. Novitski, and D. Uphoff. Dec. 1951. 68p. (UCRL-1614)

Data are presented on the viability of individuals of *Drosophila melanogaster* heterozygous for recessive sex-linked lethals. Data embrace a total of 77 different X-chromosomal lethals and indicate that the majority of, if not all, so called recessive lethals in the X-chromosome of *D. melanogaster* have a dominant effect on viability. Tests are discussed in detail.

RADIATION EFFECTS

2557

Air Force Radiation Lab., Univ. of Chicago

[RESEARCH ON THE BIOLOGICAL AND MEDICAL ASPECTS OF ATOMIC ENERGY.] QUARTERLY PROGRESS REPORT NO. 2. Jan. 15, 1952. 81p. (COO-87; Quarterly Progress Report No. 2; U21326)

Progress on the following research projects is summarized: kidney carboxypeptidase inhibitor, effects of nitrogen mustards on citrate synthesis in rat tissues, the influence of steroids on citrate synthesis, effect of partial shielding on the mortality of x-irradiated rats, cell division in the giant amoeba following x irradiation or treatment with x rays, failure of *p*-aminopropiophenone to reduce the toxicity of a nitrogen mustard in mice, preliminary prophylactic tests of various chemicals against x-radiation mortality in mice, effects of x rays on the isolated mammalian heart, and destruction of epinephrine solutions by x rays. (NRS abst.)

2558

Air Univ. School of Aviation Medicine

EFFECT OF WHOLE BODY X-RADIATION AND OF INTRAPERITONEAL HYDROGEN PEROXIDE ON A NUCLEOPROTEIN-CONTAINING FRACTION OF RAT INTESTINE AND ON WHOLE RAT INTESTINE, by Robert N. Feinstein and Carrie L. Butler. Nov. 1951. 7p. (NP-3642; U21021)

Whole-body x radiation of rats decreases the relative viscosity of alkaline blends of the intestine and decreases the percentage of the whole blend which forms tactoid. X radiation decreases the amount of dry matter, nitrogen, and phosphorus found in the tactoid. The loss in phosphorus is derived from the nucleic acid fraction. X radiation decreases the tactoid ash and tactoid ash aluminum to an extent that is of dubious statistical significance because of wide variation in control values. The ash sodium does decrease significantly.

In one experiment, intraperitoneal H_2O_2 appeared significantly radiomimetic. In a second experiment this was not found true, despite the "statistical significance" of the first findings. Such erratic results of H_2O_2 have been noted before on different lots of laboratory animals. (auth)

2559

Atomic Energy Project, Western Reserve Univ.

MONTHLY PROGRESS REPORT JANUARY 1952, by Hymer L. Friedell. [nd] 11p. (NYO-1643)

A study of the effects of antibiotics on rats given Au^{198} is being made and perliminary data are presented. Factors affecting the distribution of colloidal Au^{198} are being investigated. Preliminary data indicate that splenectomy does not significantly alter the sensitivity of the rat to total-body x irradiation. Preliminary data from an experiment to investigate the combined lethal action of nitrogen mustard with P^{32} and Au^{198} shows the combined lethal action of either isotope with the nitrogen mustard is much less than additive. Preliminary clinical investigations of the rate of protein digestion and absorption, using I^{131}-labeled protein, are reported. A number of compounds were tested for their ability to protect mice against whole-body x irradiation. Isopropyl-amine and acetate showed a significant degree of protection and will be investigated further. Effects of radiation upon growth of yeast are being investigated. The protection afforded the irradiated dog by perfusion of its blood through a donor spleen is being investigated and preliminary data are discussed.

2560
Atomic Energy Project, Univ. of Rochester
SPERMATOGENES IN THE ADULT ALBINO RAT AS REVEALED BY TISSUE SECTIONS IN THE ELECTRON MICROSCOPE, by Michael L. Watson. Jan. 21, 1952. 127p. (UR-185)

A study with the electron microscope of spermatogenesis in the adult rat is presented. It is illustrated with some fifty photographs of tissue sections made with the electron microscope. In an appendix cellular changes are described and illustrated following local irradiation of rat testes with a dose of 1000 r of 250 kv x radiation. 83 references. (auth)

2561
Army Medical Research Lab.
EFFECT OF TOTAL BODY X-IRRADIATION ON THE PLASMIN INHIBITOR TITER IN THE BLOOD OF RATS, by Walter Kocholaty, William W. Ellis and Hans F. Jensen. Dec. 15, 1951. 6p. (AMRL-71)

Exposure of rats to 1000 r total body x irradiation produced a fall in the plasmin inhibitor titer of plasma, beginning at the second day after irradiation and then gradually increasing. Since starvation was found to exert a similar effect, no definite conclusions can be made as to whether irradiation per se caused a lowering in the titer. Total body x irradiation (1000 r) and starvation caused a weight loss of nearly identical magnitude. (auth)

2562
Argonne National Lab.
CHRONIC EXTERNAL IRRADIATION; NEUTRON TOXICITY, AND HEMATOLOGY, p.9-47 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT; AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 39p. (ANL-4713(p.9-47))

Data on the effects of homologous and heterologous bone marrow injections on survival in mice following x irradiation are presented in tabular form. The addition of 0.025M K citrate to distilled water suspensions of Rous sarcoma virus gave a high degree of protection against an x-ray dose of 75,000 r. Studies on the mechanism of citrate protection are in progress. Data on the pattern of loss and recovery of weight of the testes of mice exposed to a single dose of x radiation and a single intravenous injection of Rn in equilibrium with its short-lived decay products are presented in tabular form. Results indicate that the α particle does not manifest as high a factor of biological effectiveness relative to x radiation as has been assumed. A summary is included of visible lens opacities 6 to 7 months after various doses of x radiation to the head of newborn mice. Histologic examination showed progressive destruction of the cells of the retina following 1000 r x irradiation, with obvious signs within 3 hr after irradiation. The effects of shielding of liver, intestine, or spleen, and of spleen shielding followed by splenectomy at 5 min and at 24 hr upon the hematocrit values, reticulocyte and leukocyte counts of mice exposed to 1025 r x irradiation are presented graphically. Data indicate that cysteine injected up to 4 days before sacrifice does not significantly alter the 24-hr uptake of P^{32} by rat and mouse tissues. Studies of the effects of spleen shielding and subsequent splenectomy upon antibody formation in rats receiving total-body x irradiation confirm previous observations concerning the protective effects of spleen shielding on antibody formation.

2563
Argonne National Lab.
PHYSIOLOGY, RADIUM TOXICITY, HISTOPATHOLOGY, AND RADIOCHEMISTRY, p.48-73 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 26p. (ANL-4713(p.48-73))

Data from a study of the effects of cysteine and hypoxia on the survival of rabbit thymocytes irradiated in vitro with 200-r x rays, and data on the effects of chilling on the protection afforded x-irradiated thymic cells by cysteine are presented in tabular form. From results of the study it is concluded that the effect of cysteine on irradiated thymic-cell-serum suspensions can not be ascribed to a direct competition for the short-lived free radicals presumably formed in the aqueous phase, and also that the protection is not due simply to the removal of O and consequent decrease in the toxic breakdown products of water. Preliminary results suggest that cysteine binds O rapidly in the presence of thymic cells suspended in serum, and the effect of chilling suggests that other events, presumably related to the binding of O, must take place. Further work on this problem is in progress. Changes in body weight, food intake, and water intake were found to be related to x-ray dosage in rats, and cysteine pretreatment and a force-fed, semiliquid diet greatly decreased the characteristic postirradiation drop in body weight. A method of measurement of the γ activity in humans due to the nonemanating fraction of Ra present in the body is reported and comparison is made of counting results in patients whose Ra burden was established by the absolute method of measurement, and with Rn exhaled in the breath by these patients. In the clinical study of persons exposed to radium, one 68-year-old male given radium chloride intramuscularly 25 years ago was found to have an estimated total-body radium of 13.9 μg, however, complete radiography indicates only minimal skeletal changes. A dosage of 800-r x radiation delivered to the tenotomized legs of rats did not appear to greatly disturb tendon regeneration although the regenerative process took a longer time in irradiated than in control rats.

2564
Argonne National Lab.
SPECIAL PROBLEMS, p.74-86 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 13p. (ANL-4713(p.74-86))

A method is described whereby data on tumor incidences may be put into such a form that comparison can be made according to standard statistical procedures for handling rare discrete events. In a study of the effects of pile-irradiated chlolesterol on mice it was concluded that ionizing radiation does not produce appreciable carcinogenic activity in cholesterol and that direct action of ionizing radiation on cholesterol is not responsible for radiation carcinogenesis. Data on the mortality of cysteine-treated chicks following x irradiation are presented in tabular form. Preliminary data indicate that larger cysteine doses are required to protect against radiation toxicity in newly-hatched than in older chicks. Dog plasma was found to afford protection against radiation injuries to mice when administered intravenously just prior to exposure to 800-r x radiation. The toxicity of normal dog plasma to mice was found to be lost after 5 hr incubation or perfusion through the dog spleen. White's medium, a synthetic nutrient containing salts, amino acids, and vitamins, did not afford protection to mice after perfusion through dog spleen, but did give active protection if given intravenously after perfusion through the spleen that had been lead-protected during irradiation of the dog. Neither agent was protective when administered before x irradiation.

2565

Argonne National Lab.

INVERTEBRATE ZOOLOGY, PHYTORADIOBIOLOGY, AND MICROBIOLOGY, p.87-100 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 14p. (ANL-4713(p.87-100))

With the grasshopper egg as a test object, a study was made of the effect of x irradiation on enzymogenesis. Data on the effect of x irradiation on the acetylcholine content of postdiapause grasshopper eggs are presented graphically. Preliminary experiments on the radiosensitivity of the native enzyme complex involved in the conversion of tryptophan to auxin in bean seedlings are summarized. In an attempt to correlate knowledge concerning the degradation of nitrogen mustards in solution with loss of biological effect with time, groups of P. aurelia were exposed for 1 hr to the solution at various times after its preparation. Results indicate that the mean half life of the initially active mustard component was about 20 min. Paramecia were irradiated in the lettuce medium in which they were grown, in salt solution into which they had been put just prior to exposure, in salt solution into which they had been put 14 hr prior to exposure, and in a fresh salt solution after having remained in a salt solution 14 hr prior to exposure. Suppression of fission and preautogamous death were markedly increased immediately in animals that were placed in the salt solution just before irradiation. Further investigations of the radiosensitivity of the mating reaction of P. bursaria has resulted in the hypothesis that release of the mating substance is increased by illumination while its production is inhibited by illumination. It is thought that a flavin acts as the initial photoreceptor in the early reactivity period.

2566

Argonne National Lab.

BIOCHEMISTRY AND PHYSIOLOGICAL CHEMISTRY, p.101-5 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 5p. (ANL-4713(p.101-5))

The role of H_2O_2 in the biological effects of ionizing radiation was investigated by determination of the amount of H_2O_2 produced after x irradiation of H_2O, the effect of H_2O_2 on the metabolism of bacteria and yeast, the respiration of marine eggs and sperm, and the oxidation of glutathione and dihydrodiphosphopyridine nucleotide. From these experiments it was concluded that the role of H_2O_2 in the effects of ionizing radiation on the substances and biological processes mentioned is negligible. Specific activity was determined for some of the contents of an aquarium that was seeded with C^{14}-containing Scenedesmus 3 yr ago and sealed. Results of the analyses appear to approximate the true isotope effect, which seems to be about 8% or less between mixed organic and inorganic carbonate.

2567

Argonne National Lab.

PHARMACOLOGY; THEORETICAL BIOLOGY, EXPERIMENTAL PATHOLOGY, AND TREATMENT OF POSTIRRADIATION INFECTION WITH ANTIBIOTICS, p.109-24 of DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, AUGUST, SEPTEMBER, OCTOBER, 1951. Austin M. Brues, ed. [nd] 16p. (ANL-4713(p.109-24))

Preliminary data from a study of the pharmacodynamics of compounds derived from ribonucleic acid and the effects of these compounds upon physiological changes following total-body irradiation showed that the blood pressure of rats is appreciably decreased by small amounts of adenosine and 3-adenylic acid, while other nucleic acid derivatives have much smaller effects. An approximate formula for the standard error of an absolute white cell count is used to show the dependence of the standard error on the blood count parameters and sample sizes and to develop formulas for minimum error at fixed cost as well as for minimum cost at fixed relative error. Data on the survival and incidence of malignant bone tumors in mice that had received less than 22 μc per kg of U from 210 to 415 days previously, and experimental design and survival figures at 221 days of mice which had received injections of Ra^{226} and Pu^{239} are presented in tabular form. Biometric analysis of data on the effects of various patterns of antibiotic therapy on the survival of mice following a fixed dose of x rays showed streptomycin dosages ranging from about 3000 to 6000 units per day were protective to the same degree. Penicillin plus streptomycin appeared to be less protective than streptomycin alone. Aureomycin, chloramphenical, and terramycin, all supplemented with streptomycin, conferred about equal degrees of protection.

2568

Air Univ. School of Aviation Medicine

EFFECT OF IRRADIATION ON P^{32} UPTAKE BY BONE MARROW AND SPLEEN. I. NORMAL VALUES AND THE EFFECT OF SODIUM PENTOBARBITAL, by W. A. Rambach, D. A. Moomaw, H. L. Alt and J. A. D. Cooper. Apr. 1952. 6p. (NP-3690)

Normal values are presented for the desoxyribose nucleic acid phosphorus and ribose nucleic acid phosphorus, as well as the rate of uptake of P^{32} and DNA in the bone marrow and spleen of adult rats. Anesthetic doses of sodium pentobarbital were found to produce a significant decrease in the relative rate of formation of DNA in the bone marrow and spleen during a period of 5½ hours. The significance of these observations is discussed. (auth)

2569

Columbia Univ.

QUARTERLY PROGRESS REPORT; FOOD IRRADIATION AND ASSOCIATED STUDIES, by Elmer L. Gaden, Jr. Dec. 1, 1951. 16p. (NYO-3317)

A report of progress in research on the radiation treatment of foods and accessory studies carried out at Columbia University during the period June 1 to Dec. 1, 1951, is presented. The cobalt source has been obtained from Brookhaven, installed, and calibrated. Irradiation techniques, source control, and safety procedures have been worked out. Many microbiological tests have been made and an approximate sterilization dose for raw whole milk established. Rapid destruction of certain key vitamins has been observed but enzyme activity appears to be quite radio-resistant. A proposed feeding program and the limitations imposed on it by source capacity are discussed. Accessory studies on specific biochemical systems are outlined. (auth)

2570

THE LOCAL GREYING OF HAIR IN MICE TREATED WITH X RAYS AND RADIOMIMETIC DRUGS. E. Boyland and S. Sargent. Brit. J. Cancer 5, 433-40(1951) Dec.

The intradermal injection of nitrogen mustards or sulphur mustard into colored mice causes a permanent graying or bleaching of the hair similar to that occurring after exposure to ionizing radiations. This graying appears to be a radiomimetic effect. Similar graying of hair occurs in a proportion of cases when water is injected but never following the injection of saline. Graying of hair was produced by injection of known carcinogens, such as β-naphthyl-bis (β chloroethyl) amine and butadiene diepoxide, the mustards, 2 : 4 : 6-tri(ethyleneimino) 1 : 3 : 5-triazine and benzoquinone, known cytotoxic agents and mutagens which are not yet known to be carcinogenic, such as tert-butyl-hydroperoxide and formaldehyde, and substances which are not known to be carcinogenic, cytotoxic or mutagenic, including salts of iron and lanthanum and substances which might give free radicals, such as benzene diazonium hydroxide and perbenzoic acid. Graying was not produced by injection of some carcinogens, including urethane and dimethylaminostilbene derivatives. This effect, which may be an induced permanent variation due to preferential lethal action on pigment-producing dendritic cells, is an example of limited toxic action, and so allied to vesication and induction of mutations and cancer. (auth)

2571

POSSIBLE BIOLOGICAL SIGNIFICANCE OF THE ACTION OF IONIZING RADIATIONS ON NUCLEIC ACIDS. Joseph Weiss. Nature 169, 460-1(1952) Mar. 15.

The small amount of radiation required to induce marked biological effects, in contrast to that required to produce chemical effects, suggests a chain-reacting process. The author proposes the following nonspecific mechanism. The raidcals produced by the primary action of the ionizing radiations attack the base and/or the sugar components of the nucleic acid. In this way some phosphate esters are produced which are relatively unstable and, in particular, tend to undergo hydrolysis with the formation of inorganic phosphate, leading to further degradation of the nucleic acid molecule.

2572

RADIATION HAZARDS TO THE EMBRYO AND FETUS. Liane Brauch Russell and W. L. Russell. Radiology 58, 369-77(1952) March.

The radiosensitivity of the human embryo and fetus is discussed in the light of information available in the literature and results from recent extensive animal experiments which present an over-all picture and clarify some apparent contradictions in the human data. Susceptibility of the developing embryo to the induction of malformations by radiation, critical periods in development, dosages which may produce development of abnormalities, direct radiation effects on the embryo, and indirect effects via maternal injury are discussed. Precautions to be observed during irradiation involving the uterus in women of child-bearing age are presented.

2573

A PROBABILITY MODEL OF RADIATION DAMAGE. A. T. Reid. Nature 169, 369-70(1952) Mar. 1.

The probability that initial radiation damage to a system will cause a certain ultimate effect is discussed on the basis of Markov chains. The model is that of a control molecule or group of molecules to which chain macromolecules, assumed to be formed from cellular constituents, are connected. The control molecule is considered to be, or to be associated with, the sensitive volume, and following a "hit" the initial damage is assumed to be transmitted or amplified through the system by the chain depolymerization of the macromolecules. The complete regradation of the macromolecules is considered as being responsible for the observable damage to the system. The centrosome might be considered as the control group and the aster fibers as the chain molecules that undergo depolymerization.

RADIOGRAPHY

2574

Radiation Lab., Univ. of Calif.

USE OF A GAMMA RAY PINHOLE CAMERA FOR IN-VIVO STUDIES, by H. O. Anger. Feb. 21, 1952. 6p. (UCRL-1685)

An intensifying screen for use with a pinhole camera which reduces the exposure time while taking γ radioautographs is described. The intensifying screen consists of a large, flat NaI(Tl) crystal. The γ rays produce scintillations in the crystal which in turn expose the photographic plate. A drawing of the pinhole camera and the intensifying screen is given. The camera was used to take an in-vivo γ-ray pinhole radioautograph of a tumor containing 20 mc of I^{131}.

RADIOTHERAPY

2575

RADIOACTIVE METALLIC GOLD COLLOIDS COATED WITH SILVER AND THEIR DISTRIBUTION IN THE LUNG AND ITS LYMPHATICS FOLLOWING INTRA-PULMONARY ADMINISTRATION; THERAPEUTIC IMPLICATIONS IN PRIMARY LUNG AND BRONCHIOGENIC TUMORS. P. F. Hahn and E. L. Carothers. Brit. J. Cancer 5, 400-4(1951) Dec.

When silver is dispersed in the presence of radioactive metallic colloidal gold particles as nuclei, a colloid is formed which acts as though it were a silver colloid as regards chemical and physiological behavior. Administered by intrapulmonary route by means of a bronchoscope the silver-coated gold colloid is rapidly removed from the lung parenchyma in considerable proportions and appears in the lymph nodes draining the lung region. Silver-coated Au^{198} metallic colloids may offer a means of providing selective radiation to the lung parenchyma, as well as the lymph nodes draining the pulmonary system in malignant disease of the bronchus and lung. (auth)

TOXICOLOGY STUDIES

2576

Argonne National Lab.

SALICYLATES AND EXPERIMENTAL BERYLLIUM POISONING, by Asher J. Finkel and Marcia R. White. Mar. 1952. 5p. (AECU-1930; UAC-536)

The present study was undertaken to ascertain if the salicylic acid portion of the aurintricarboxylic acid molecule would be effective in reversing experimental Be intoxication. Data show that intravenously or intraperitoneally administered sodium salicylate in dose levels of 600 mg per kg is an effective antidote for acute Be poisoning in mice when given up to 8 hr after the administration of intravenous $BeSO_4$ in LD_{95} amounts. Salicylate analogs without the ortho-hydroxy, carboxylic acid groupings were generally ineffective, as were two dihydroxy-benzoates.

TRACER APPLICATIONS

2577

Biophysical Lab., Harvard Medical School

THE PERMEABILITY OF THE HUMAN ERYTHROCYTE TO SODIUM AND POTASSIUM, by A. K. Solomon. [nd] 82p. (AECU-1932)

The permeability of the human erythrocyte to Na and K was investigated using fresh heparinized whole blood to which small quantities of isotonic solutions of glucose, $Na^{24}Cl$, and $K^{42}Cl$ were added. Data on permeability, temperature coefficient of the two permeabilities, and the relationship between external concentration of Na and K and their relative permeabilities are presented. Thermodynamic constants of the two processes were measured where possible. 70 references.

2578

Radiation Lab., Univ. of Calif.

RADIOACTIVE EGGS. III. DEGRADATION OF YOLK GLYCEROL, by David Kritchevsky and S. Abraham. Feb. 21, 1952. 9p. (UCRL-1684)

The labeled glycerol obtained from the eggs of a hen continuously fed sodium acetate-1-C^{14} for 7 days has been degraded by two methods. The general pattern of activity distribution is 86 to 88% in the terminal carbon atoms and 12 to 14% in the middle carbon atom. A mechanism that might explain these results has been suggested. (auth)

2579

Atomic Energy Project, Western Reserve Univ.

THE DETERMINATION OF CARDIAC OUTPUT BY A CONTINUOUS RECORDING SYSTEM UTILIZING IODINATED (I^{131}) HUMAN SERUM ALBUMIN; CLINICAL STUDIES, by Walter H. Pritchard, William J. MacIntyre, William C. Schmidt, Bernard L. Brofman and Douglas J. Moore. [nd] 22p. (NYO-1640)

A method previously described for the determination of cardiac output by the injection of iodinated (I^{131}) human serum albumin has been extended to a study of its application to patients. A technique suitable for clinical use has been described and values obtained have been compared with those simultaneously determined by cardiac catheterization. The average deviation from Fick principle values was ±8.3% over a range from –8.4 to +18.7%. Certain precautions in technique necessary for accuracy have been stressed. (auth)

2580

Radiation Lab., Univ. of Calif.

THE PATH OF CARBON IN PHOTOSYNTHESIS; XVI. KINETIC RELATIONSHIPS OF THE INTERMEDIATES IN STEADY STATE PHOTOSYNTHESIS, by S. Kawaguchi, A. A. Benson and M. Calvin. Feb. 5, 1952. 22p. (UCRL-1658)

A kinetic study of the accumulation of C^{14} in the intermediates of steady state photosynthesis in $C^{14}O_2$ provides information regarding the sequence of reactions involved. The work described applied the radiochromatographic technique for analysis of the labeled early products. The simultaneous carboxylation reaction resulting in malic acid as well as phosphoglycerate is demonstrated in experiments at high light intensity. A comparison of radioactivities in a number of phosphorylated sugars as a function of time reveals concurrent synthesis of fructose and sedoheptulose phosphates followed by that of ribulose phosphates and later by that of glucose phosphates. Evidence for the existence of two sedoheptulose monophosphates is presented. The possibility that the cleavage of C_4 compounds to C_2 carbon dioxide acceptors may involve C_7 and C_5 sugars and evidence for this mechanism is suggested. (auth)

2581

Iowa State Coll.

BACTERIAL SYNTHESIS OF ALANINE AND GLUTAMATE, by Eric B. Fowler and C. H. Werkman. [nd] 11p. (AECU-1929)

C^{14} carbonyl-labeled pyruvate was used to determine the extent of utilization of added pyruvate by bacteria in the synthesis of alanine and whether pyruvate *per se* or one of its products is involved in the synthesis of glutamate. Added pyruvate was found to serve as a precursor for approximately one-half of the alanine synthesized by the cell-free extracts of *Aerobacter aerogenes*. More alanine was found to be synthesized under anaerobic than under aerabic conditions. Unequivocal reductive ammoniation of pyruvate was not demonstrated. It was concluded that the synthesis of alanine probably is associated with phosphorylation. Glutamine was not found to stimulate the synthesis of alanine. The incorporation of pyruvate in glutamate was demonstrated. More than one pyruvate residue was utilized by cell-free extracts of *A. aerogenes* in the synthesis of glutamate.

2582

DIFFUSION AND ACTIVE TRANSPORT OF WATER IN THE AMOEBA *CHAOS CHAOS* L. Sϕren Lϕvtrup and Andrezej Pigoń. *Compt. rend. trav. lab. Carlsberg Sér. chim.* *28*, No. 1, 1-36(1951). (In English)

By means of the Cartesian diver balance in combination with isotopic water (D_2O and H_2O^{18}) the rate of water diffusion through the membrane of the amoeba *Chaos chaos* has been determined. It was found that the permeability constants for ordinary water and the two isotopic forms were identical within the limits of accuracy of the method. The value was found to be about 0.25 μ/sec. From this value, and the osmotic concentrations inside the cell (94mM) and in the medium (7 mM), which were calculated from vapor-pressure determinations, the active transport of water across the cell membrane was calculated as 2 to 4% of the total volume per hour. It was found experimentally, and verified by calculations, that the energy expenditure associated with water elimination is negligible compared to the total metabolism of the organism. The possibilities of the present method in work on permeation of water and other substances are discussed. (auth)

2583

FORMATE AS A PRECURSOR OF CARBOXYLIC ACIDS IN FUNGI. W. E. Jefferson, J. W. Foster, E. F. Phares, and S. F. Carson. *J. Am. Chem. Soc.* *74*, 1477-8(1952) Mar. 20.

C^{14}-formate was used as a tracer of glucose metabolism by washed mycelial suspensions of lactic acid and fumaric acid producing strains of *Rhizopus* shaken in air. Fumaric and lactic acids and ethanol were isolated and purified. Each had significant radioactivity, indicating that the formate-carbon entered these molecules. Degradation of each compound showed radioactivity was present in each carbon of all the compounds studied. Specific activity of non-carboxyl carbons of the C_4 dicarboxylic acids was equal to or greater than that of carboxyls. Specific activity of the β-carbon of lactic acid was many times greater than that the α-carbon and the carboxyl. Specific activity of the methyl carbon of ethanol was higher than that of carbinol carbon. These results indicate that formate can function as a precursor of methyl and methene groups in organic acid metabolism of fungi. The data for lactate stress the possibility of synthesis of the 3-carbon chain by the following type of reaction: $H\underset{a}{C}OOH + \underset{b}{C}\underset{c}{C} \rightarrow \underset{a}{C}H_3\underset{b}{C}HOH\underset{c}{C}OOH$. (auth)

CHEMISTRY

2584

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 104p. (NP-3698)

Separate abstracts have been prepared for the following sections of this report: Chemistry of the Fission Elements Group, Cosmic Ray Group, and Elementary Particle Scattering Group, p.1-23; MIT-ONR Generator Construction and High Voltage Research Group and Nuclear Chemistry (Inorganic) Group, p.24-43; Nuclear Chemistry (Organic) Group and ONR Generator Group, p.44-53; and Radioactivity and Cyclotron Group, Synchrotron Group, and Theoretical Group, p.54-96.

2585

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

CHEMISTRY OF THE FISSION ELEMENTS GROUP, COSMIC RAY GROUP AND ELEMENTARY PARTICLE SCATTERING GROUP, p.1-23 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 23p. (NP-3698(p.1-23))

Preliminary results are reported on the following: a polarographic study of the reduction of In in nitrate and perchlorate supporting electrolytes at the dropping Hg cathode; variables affecting atomizer efficiency in flame photometry; automatic performance of thermometric titrations using thermisters and a recording potentiometer; spectrophotometric determination of heavy metals as halide complexes; fluorometric determination of Sm; polarography using solid electrodes; coulometric dissolution of metals from a Hg electrode; and determination of trace amounts of Ag by catalysis. The balloon experiment on the hard component of cosmic rays has been completed, and the results are plotted as a function of atmospheric depth. Events observed in a high-pressure cloud chamber exposed to the MIT synchrotron beam are described. The total n-d scattering cross section has been measured at 350 and 590 kev, giving $\sigma_{350} = 2.96 \pm 0.10$ and $\sigma_{590} = 2.9 \pm 0.2$ barns. The first crude data for the activities separated after photon irradiation of Zn are tabulated. Tracks observed in nuclear emulsions due to the photoproduction of neutral mesons in H are briefly described. The experiment at the linear accelerator in which the angular distribution of fast photoneutrons is studied by means of threshold detectors is discussed; the detector arrangement and results of a typical run with a Pb target are shown.

2586

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

M.I.T.-O.N.R. GENERATOR CONSTRUCTION AND HIGH VOLTAGE GROUP AND NUCLEAR CHEMISTRY (INORGANIC) GROUP, p.24-43 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 20p. (NP-3698(p.24-43))

The outgassing properties of several common gaskets and some new ones were studied with a HK-54 ion gauge and with a Knudsen gauge; results are tabulated as rate of gas evolution in ml/sec. Experiments have been performed to study the correlation between electrolytic conductance and self diffusion of Na ions in an ion-exchange membrane; a table shows the self-diffusion coefficient of Na in phenolsulfonic ion-exchange resins as determined by the spread of Na^{22} from a sharp boundary and as computed from the electrolytic conductance. Data from the literature on the relative yields of isomeric states in the thermal (n,γ) reaction are tabulated, together with spins of the target nucleus, the compound nucleus, and the upper and lower states; these data show that where an isomeric pair is formed by neutron capture in a target nucleus of spin value about midway between the spin values of the two product isomers, then both isomers are formed in about equal amounts. The distribution of Ge(IV) between aqueous HCl and β,β'-dichlorodiethyl ether as a function of acid concentration and of Ge(IV) concentration is being investigated by a radioactive-tracer technique. Values of the distribution coefficient for various HCl concentrations are given. An empirical evaluation is being made of unpaired-spin effects for protons and neutrons; a provisional detailed canvas of masses from 39 to 149 was made to look for systematic evaluations of the π-ν difference (π is the spin destabilization for an unpaired proton and ν is that for an unpaired neutron), and the numerical values of π-ν are plotted as a function of A.

2587

[Atomic Energy Research Establishment, Harwell, Berks (England)]

NOTE ON THE INVESTIGATION OF ALUMINA BY MEANS OF THE HAHN EMANATION TECHNIQUE AND X-RAY MEASUREMENTS, by S. Moorbath. [nd] 4p. (AERE-C/M-127)

An attempt has been made to correlate the emanating power of alumina with several of the metastable phase transformations by heating the sample just beyond each peak on the emanation curve and taking x-ray photographs. The emanating power-temperature behavior of the alumina is plotted. Data are given on: the diffraction pattern of the original unheated sample; x-ray patterns at 500°C, 650°C, 785°C; and x-ray films at 910°C, 1040°C, 1067°C, and 1125°C.

2588

Illinois Inst. of Tech.

THE REACTIONS OF METALS WITH GASES AND SALTS AT HIGH TEMPERATURES; THE KINETICS OF THE REACTION OF GERMANIUM AND OXYGEN, by Richard B. Bernstein and Daniel Cubicciotti. Oct. 1950. 13p. (NP-3149; Technical Report No. 9)

2589

Cryogenic Lab., Ohio State Univ.

THE HEAT CAPACITY OF GALLIUM FROM 15° TO 320° K; THE HEAT OF FUSION AT THE MELTING POINT, by George B. Adams, Jr., Herrick L. Johnston, and Eugene C. Kerr. [nd] 20p. (NP-3672; Technical Report No. 15; U21185)

The heat capacity of solid Ga (99.99% purity) was measured from 15 to 300°K with the calorimeter described by Johnston and Kerr (J. Am. Chem. Soc. 72, 4733(1950)). The heat capacity of liquid Ga as measured from 303 to 322°K decreased with increasing temperature. The heat of fusion of pure Ga was calculated to be 1335.2 ± 1.0 cal/g atom. The entropy of fusion was 4.407 ± 0.004 E.U. (entropy units) at 29.78°C. The heat capacity of the liquid and the heat of fusion were measured in a specially designed calorimeter. The principal deviations from the standard design were the omission of internal heat-transfer vanes, the use of a seamless Ta foil liner, change in type of closing gap, and the use of enameled alloyed Au resistance thermometer wire. The λ point (292.4°K) observed in the heat-capacity curve for the solid was caused by eutectic melting of Sn (present as an impurity). The entropies at 298.16 and 302.94°K were 9.82 ± 0.05 and 9.92 ± 0.05 E.U., respectively, of which 0.15 E.U. was contributed by extrapolation below 16°K. (Extension and revision of TIP U7521) (NRS abst.)

2590

Colorado Univ.

LUMINESCENCE SPECTRA OF ORGANIC COMPOUNDS; FINAL REPORT FOR THE CONTRACT PERIOD JANUARY 1, 1950 TO DECEMBER 30, 1951. [nd] 66p. (NP-3638; U21055)

The absorption and fluorescence spectra of several organic compounds as dilute (0.001M) solutions in MeOH were detemined between 240 and 440 mμ to investigate the effect of atomic and structural groupings on the luminescence of the molecule. A phosphoroscope was constructed on the principle of the apparatus used by Lewis and Kasha (J. Am. Chem. Soc. 66, 2100(1944)); spectra were recorded with a Hilger medium all-quartz spectrograph. Absorption and fluorescence data are presented as plots of extinction coefficient and relative light intensity, respectively, vs. wave length. All compounds showed a rather abrupt change from high transmittancy to high absorbancy over a narrow wave-length range, indicating a threshold energy upon which were imposed different vibrational levels that blended into a continuous region of absorption. All compounds displayed fluorescence in the ultraviolet region. Certain peaks occurred consistently with the same atomic or group substituent. Some structural groups contributed specific bands. Amine or imine groups increased the fluorescence in a given region and eliminated the contributions of groups which normally established fluorescence in other portions of the spectrum. The fluorescence spectra of Ph_3N, Ph_3CH, Ph_3COH, phenolphthalin, phenolphthalein, and fluorescein showed a characteristic broad band with no vibrational resolution. Attempts to record the phosphorescence of the compounds in the glassy medium, ethylene borate, were unsuccessful, apparently because the light sources were not sufficiently intense to produce phosphorescence recordable photographically. The half life of phosphors appeared sufficiently long for determinations with the shutter speed used (excitation time of 1/345 sec and lapse time of 1/700 sec). The type of light, monochromatic or polychromatic, did not appear to alter either the fluorescence or phosphorescence spectra. (cf. TIP U16309) (NRS abst.)

2591

Cryogenic Lab., Ohio State Univ.

THE HEAT CAPACITY OF BETA-GALLIUM OXIDE FROM 15° TO 300°K, by George B. Adams, Jr. and Herrick L. Johnston. [nd] 10p. (NP-3636; TR-283-14; U20892)

Heat capacities were determined in the temperature range of 15 to 300°K for a sample of 98.67% β-Ga_2O_3 prepared from its hydrated oxide. The β form was obtained by heating the partially dehydrated oxide in a Pt crucible at 1300°C for 4 hr. Quantitative spectroscopic analysis subsequent to the calorimetric measurements showed the presence of V_2O_5, MoO_3, MnO, PbO, all 0.001%; CuO, 0.008%; MgO, 0.01%; SnO_2, 0.02%; Fe_2O_3 and Al_2O_3, each 0.05%; and ZnO, 0.1%. Chemical analysis indicated that 1.16% SiO_2 was also present. The heat-capacity points were corrected for all impurities present in amounts exceeding 0.001%. Graphical integration of the heat-capacity curve gave a molal entropy of 20.23 ± 1 entropy units at 298.16°K. The thermodynamic functions at smoothed temperature values are tabulated. (NRS abst.)

2592

National Bureau of Standards

THE HEAT CAPACITY OF LITHIUM FLUORIDE FROM 0° TO 900°C; THE MELTING POINT AND HEAT OF FUSION, by Thomas B. Douglas and James L. Dever. Jan. 10, 1952. 27p. (NBS-1406)

By use of an ice calorimeter and a furnace containing a silver core, the relative enthalpy of lithium fluoride was measured from 0 to 900°C. These measurements, at nine temperatures for the solid and three for the liquid, possessed a probable error of the mean of 0.03% on the average, and led to a heat of fusion of 1043.6(± 5) absolute joules per gram. The melting point was measured and found to be 848°C(± 1°). After the sample had been frozen rapidly, the mean heat capacity between 0 and 550° was found to be lower by 0.2%. The derived heat capacity values of the solid are believed to be accurate in general to within ±0.75%, and the mean heat capacity of the liquid between 848 and 900°C, to ±1.5%. The heat capacity-temperature curve of the solid is in good agreement with values recently reported in the literature for the range 19 to 272°K (−254 to −1°C). (auth)

2593

Radiation Lab., Univ. of Calif.

THE VAPOR PRESSURE OF URANIUM TETRAIODIDE, by Norman W. Gregory. Aug. 6, 1946. Decl. Mar. 21, 1952. 6p. (AECD-3342; BC-14)

The vapor pressure of liquid UI_4 has been studied in a modified boiling-point apparatus. While the data are subject to uncertainties because of the instability of the liquid, values have been obtained which were reproducible within a reasonable error in four independent experiments. The analytical expression representing the vapor pressure in the liquid range is the following:

$$\text{Log}_{10} P_{mm} = \frac{-7.143}{T \times 10^{-3}} + 9.823$$

The maximum error in the heat of vaporization is not expected to exceed five kcals/mole. (auth)

2594

Brookhaven National Lab.

THE IONIZATION CONSTANTS AT 50° OF META-AND PARA-IODOXYBENZOIC ACIDS, by Aksel A. Bothner-By and Avrom I. Medalia. [nd] 13p. (BNL-1135)

The ionization constants of benzoic, m-iodobenzoic, p-nitrobenzoic, m-iodoxybenzoic and p-iodoxybenzoic acids in aqueous solutions at 50°C have been determined from pH-titration curves. The Hammett ρ function was calculated from the pK_a's of the first three acids and their accepted σ values as 1.09 ± 0.03. The σ function values for the m- and p-iodoxy groups were calculated to be 0.63 ± 0.03 and 0.69 ± 0.03, respectively. (auth)

2595

Ames Lab.

SPECTROPHOTOMETRIC INVESTIGATIONS OF SOME COMPLEXES OF RUTHENIUM. IV. RUTHENIUM REACTIONS WITH 4-PHENYLTHIOSEMICARBAZIDE AND DIPHENYLTHIOCARBAZIDE, by Ruth Powers Yaffe and Adolf F. Voigt. Mar. 25, 1952. 10p. (ISC-196)

The ruthenium(IV)-4-phenylthiosemicarbazide system has been studied spectrophotometrically. It was found that both Ru(III) and Ru(IV) form the same bright red complex, $Ru[SC(NHNH_2)NC_6H_5]_1^{+2}$. In the reaction the 4-phenylthiosemicarbazide behaves as an acid, liberating a hydrogen ion for each molecule of ligand which goes into the complex. At unit ionic strength the complex was found to have a stability constant of 45 ± 2. Ruthenium was found to cause the oxidation of diphenylthiocarbazide to dithizone with which it readily complexes giving a deep violet-colored solution. (auth)

2596

Florida State Univ.

[EXCHANGE BETWEEN LABELLED HALOGENS AND CERTAIN INORGANIC HALIDES.] PROGRESS REPORT, by Rowland E. Johnson. [nd] 9p. (ORO-61)

HCl solutions containing Cl^{36} were oxidized with MnO_2 in H_2SO_4. The Cl_2^{36} so obtained exchanged completely with $TeCl_4$ in the vapor phase in 5 min. A half time of exchange of 3 sec or less at room temperature was found for Cl_2^{36} and $TeCl_4$ in benzene solution. Exchange experiments between PCl_5 and Cl_2^{36} in CCl_4 solution showed about 20% exchange in 10 sec at room temperature. Exchange between Cl_2^{36} and CCl_4 showed a first-order dependence on the amount of light, with a half time of exchange of 5 hr when illuminated by a carbon arc at room temperature.

2597

Iowa State Univ.

THE STABILITY OF SOME QUATERNARY AMMONIUM POLYHALIDES IN ETHYLENE CHLORIDE, by Robert E. Buckles, Alexander I. Popov, James P. Yuk and Jack F. Mills. [nd] 25p. (AECU-1937)

As a part of a program of research on the reactions of halogens with organic compounds in relatively nonpolar solvents, an investigation of the stability of several quaternary ammonium polyhalides in ethylene chloride was carried out. The absorption spectra of tetramethylammonium triiodide, tetrabutylammonium tribromide, and tetramethylammonium iododichloride in ethylene chloride were in fairly close agreement with those reported for the corresponding trihalide ions in water or ethanol. Such was not the case with the corresponding halogens which have entirely different spectra in oxygen-containing solvents because of complex formation. The degree of dissociation of each of the trihalides in ethylene chloride was measured spectroscopically. These values are considerably higher than the pK's of dissociation reported for the corresponding trihalide ions in the more polar solvents such as water or alcohol.

2598

Iowa State Univ.

PROGRESS REPORT ON THE BEHAVIOR OF ORGANIC COMPOUNDS AT THE DROPPING MERCURY ELECTRODE IN NON-ASSOCIATED ANHYDROUS SOLVENTS, by Stanley Wawzonek, Reynold A. Berkey, Eli. W. Blaha and Francis D. Thomson. Mar. 21, 1952. 16p. (AECU-1934)

Progress is reported on the polarographic behavior of organic compounds in acetonitrile, dimethylformamide, and in methanesulfonic acid. The work in acetonitrile has involved the study of the large-scale electrolytic reduction of stilbene to obtain data on the second polarographic wave observed with this compound. Results indicate that in the electrolytic reduction stilbene is converted into dibenzyl. Stilbene was studied polarographically in dimethylformamide and data indicate that this medium is suitable for polarography. Methanesulfonic acid was found to be suitable for polarographic studies without an inert electrolyte. Results are still not sufficiently complete to make definite conclusion about the mechanism of the reduction processes in methanesulfonic acid. Future studies are outlined.

2599

Lewis Flight Propulsion Lab., NACA

BONDING OF MOLYBDENUM DISULFIDE TO VARIOUS MATERIALS TO FORM A SOLID LUBRICATING FILM. I. THE BONDING MECHANISM, by Douglas Godfrey and Edmond E. Bisson. Feb. 1952. 16p. (NACA-TN-2628)

The use of molybdenum disulfide MoS_2 as a solid film lubricant in applications where designs or temperatures preclude liquid lubricants is dependent upon successful bonding of MoS_2 to the surface. An experimental investigation was conducted to determine the basic mechanism of bonding MoS_2 and extend application of the bonding to a variety of materials. When MoS_2 was applied to a surface as a mixture of MoS_2 powder and some liquid vehicles, the liquid vehicle decomposed and polymerized to a resin which bound the particles of MoS_2 together and to the surface to be lubricated. MoS_2 can be bonded by resin-forming viscous liquid vehicles, such as asphalt- and silicone-base varnishes, glycerine, ethylene glycol, polyglycol ether, and corn syrup to a variety of materials, such as steel, aluminum, brass, stainless steel, and glass. The reduction of Fe_2O_3, formed by preheating steel in air, to Fe_3O_4 by one of the liquid vehicles (syrup) improves the fractional properties of the solid lubricating film. Rubbing of MoS_2 whether dusted, built-up, or bonded by a resin to a surface produced distinct preferred orientation. (auth)

2600

ISOTOPE EFFECTS IN THE THERMAL DEAMMONATION OF PHTHALAMIDE. F. W. Stacey, J. G. Lindsay, and A. N. Bourns. Can. J. Chem. 30, 135-45(1952) Feb.

A study has been made of the nitrogen isotope effects occurring in the deammonation of phthalamide of normal isotopic abundance. It has been found that the reaction of phthalamide-$N^{14}N^{15}$ leading to $N^{14}H_3$ formation occurs 1.2% more readily than that giving $N^{15}H_3$. In addition, a 0.6% greater probability of formation of $N^{14}H_3$ from phthalamide-N^{14},N^{15} than from phthalamide-N^{14},N^{14} has been observed, due consideration being given to the presence of one N^{14} atom in the former and two N^{14} atoms in the latter amide species. An explanation has been advanced based on the effect upon activation energy of the isotopic mass of the nitrogen atom in the C-N bonds broken and formed in the reaction. (auth)

2601

THE In-In_2S_3 SYSTEM. M. F. Stubbs, J. A. Schufle, A. J. Thompson, and J. M. Duncan. J. Am. Chem. Soc. 74, 1441-3(1952) Mar. 20. (cf. NSA 5-7108)

A phase diagram for the In-In_2S_2 system obtained by thermal analysis, metallographic, and x-ray studies is presented. Compounds In_2S_3, (In_3S_4), (In_5S_6), and InS are found to exist, but not the previously reported compound In_2S. The melting point of In_2S_3 is found to be 1090–1100° with decomposition. X-ray evidence has been obtained to supplement the thermal anaylsis, and compounds In_2S_3, (In_5S_6), and InS are found to be stable at room temperature. (auth)

2602

PRECIPITATION FROM HOMOGENEOUS SOLUTION. Louis Gordon. Anal. Chem. 24, 459-62(1952) Mar.

In the process of precipitation from homogeneous solution, the precipitant is generated uniformly throughout the entire reaction region. This procedure thus avoids the concentration gradients which characterize the ordinary mode of precipitation. A comparison of the precipitates formed in the two processes indicates the superiority of the homogeneous method because there is much less coprecipitation of interfering elements. The precipitate is also more readily filtered and washed, owing to its dense and compact character. Among the precipitates studied were Al, Fe, Sn, and Th oxides and Ca and Mg oxalates. 37 references.

AEROSOLS

2603

DETECTION OF MICRON AND SUBMICRON CHLORIDE PARTICLES. Ben K. Seely. Anal. Chem. 24, 576-9(1952) Mar.

A method was developed to detect the presence and to study the concentration of individual chloride particles in the atmosphere, in order to add to the meteorological data concerning the relative origin and behavior of certain air masses. This procedure proved to be capable of detecting and recording the presence of individual chloride particles approximately 0.2 μ in diameter and representing a mass of about 10^{-14} g. This method has been used extensively for the past 3 yr and has produced reliable data. An extremely sensitive microchemical test has been developed which can be applied to other fields of study, and with slight modifications is applicable to the detection of many ions other than chlorides. In most cases a permanent record is obtained. (auth)

ANALYTICAL PROCEDURES

2604

Battelle Memorial Inst.

THE DETERMINATION OF HYDROGEN IN MAGNESIUM, LITHIUM, AND MAGNESIUM ALLOYS, by M. W. Mallett, A. F. Gerds, and C. B. Griffith. Nov. 13, 1951. 21p. Decl. Mar. 21, 1952. (AECD-3333; BMI-708)

Two satisfactory methods of analyzing magnesium-lithium alloys for hydrogen were developed. The methods are: (1) the tin-fusion method and (2) the method of extractin hydrogen from the specimen sealed in a steel capsule at 650 to 800°C. In the latter method the lithium tended to diffuse into the capsule by attacking inclusions in the steel, but this did not invalidate the analytical results. The tin-fusion method has also been found suitable for determining the hydrogen content of pure magnesium. This same method probably can also be used to analyze pure lithium for hydrogen. However, in this case it is necessary to take special precautions to protect the freshly cut surface of the lithium from the atmosphere while it is being weighed and loaded into the furnace. The hydrogen contents of both lithium and magnesium-lithium alloys increased when exposed to the atmosphere. (auth)

2605

Army Medical Research Lab.

THE INFLUENCE OF VISIBLE LIGHT ON THE SULFHYDRYL CONTENT OF YEAST CELLS AFTER IONIZING AND ULTRAVIOLET IRRADIATION, by Walter Kocholaty and Jack Denson. Dec. 15, 1951. 11p. (AMRL-72)

An amperometric method for the determination of sulfhydryl groups was developed, which permitted the detection of sulfhydryl compounds in amounts of 10 γ with a precision of at least ±2%. Evidence is presented that this method will permit the determination of sulfhydryl compounds within the yeast cells. Yeast cultures irradiated with sufficient doses of ultraviolet light, or with soft x rays, showed a decrease in sulfhydryl content as well as the number of viable cells. Subsequent irradiation of the ultraviolet irradiated cells with strong visible light led to a partial reversal—an increase in the sulfhydryl content as well as the number of viable cells. Subsequent irradiation of the soft x-ray-treated cells with visible light had no effect on the sulfhydryl content of the cells, but did lead to a slight increase in the viable cell count. (auth)

2606

California Univ., Berkeley

THE TEMPERATURE DEPENDENCE OF THE SOLUBILITY OF SOLID NONELECTROLYTES, by J. H. Hildebrand. [nd] 5p. (AECU-1925)

The solubilities of nonelectrolytes in solutions from which chemical interactions are absent, when plotted as logarithm of mole fraction vs. logarithm of absolute temperature, yield practically straight lines except near the melting point of the solute. This offers a superior method of smoothing out solubility data and of predicting the temperature coefficient of solubility from a single point by comparison with neighboring lines for other solvents. An explanation is given for this behavior. (auth)

2607

VOLATILIZATION RATES OF ELEMENTS IN THE HELIUM DIRECT CURRENT ARC. UTILIZATION OF A MATRIX FOR BIOLOGICAL WORK. Bert L. Vallee and Ruth W. Peattie. Anal. Chem. 24, 434-44(1952) Mar.

The volatilization rates of 31 elements, including Al, Be, Li, Sc, Y, Ti, Zr, V, Nb, and Bi, were studied at 6 and 15 amp for neutral atom lines and lines of the first ionization by the use of the moving plate technique. The volatilization characteristics of some elements differ in air and He, all other parameters being constant. This is an important phenomenon when quantitative analytical spectrography is to be performed with the direct current arc using the internal standard principle, as the volatilization characteristics of the elements are an important criterion for the selection of internal standards. When He is the environment of the direct current arc, it favors the excitation of ion lines and may depress the signal of neutral atom lines. The relative sensitivity of spectrochemical determinations in He using neutral atom lines is nevertheless often better than in air because of the low background. This feature is especially favorable when lines are in the cyanogen region of the spectrum where, otherwise, they could not have been determined at all. The volatility of many elements exhibited a qualitative resemblance related to their chemical grouping. Arcing at 15 amp reduced sensitivity markedly and diminished differences in volatilization time and contour. Thus the choice of He as an environment of the direct current arc brings about decisive changes in volatility and line intensities. The resultant improvement in sensitivity for the condition stated should be a material aid to the analyst. (auth)

2608

ANALYTICAL CHEMISTRY OF NIOBIUM AND TANTALUM. Russell H. Atkinson, Joseph Steigman, and C. F. Hiskey. Anal. Chem. 24, 477-88(1952) Mar.

A critical review of the main separative reactions employed in the analysis of Nb and Ta minerals reveals a number of serious defects: the colloidal character of solutions and precipitates, the small chemical differences among the elements, and the large number of repetitive steps involved. It was thought that some of the more serious defects could be overcome by developing nonaqueous separations. For this purpose a new atmospheric chlorination method was developed applicable to the highest oxides of groups IV, V, VI, and VII of the periodic table. The method employs octachloropropane in large excess heated to about 300°C. One consequence has been the chlorination and distillation separation of Ti and Sn from synthetic oxide mixtures containing Nb, Ta, and related elements. Quantitative removal of Ti and Sn from samples as small as 0.1 g has been effected. With larger samples the Nb(V) oxide may be made spectroscopically free of Ti with one distillation. Zr in moderate amounts does not affect the separation. Fe(III) oxide must be removed in advance of chlorination to avoid catalytic decomposition of the chlorinating agent. These separations lay the groundwork for a new system of analysis of the niobite minerals. (auth)

2609

POLAROGRAPHIC DETERMINATION OF LOW CONCENTRATIONS OF SILVER. G. C. B. Cave and David N. Hume. Anal. Chem. 24, 588(1952) Mar.

By taking unusual precautions, such as working in an air-conditioned room, grounding all parts of the apparatus, and careful choice of applied voltage, it was possible to determine Ag in large amounts of thiocyanate polarographically over the range 5×10^{-6}M to 0.01M Ag with a precision of 0.5% except at the lowest concentrations, where ±5% was obtained.

2610

QUANTITATIVE ELECTRODEPOSITION OF PLUTONIUM. Harold W. Miller and Richard J. Brouns. Anal. Chem. 24, 536-8(1952) Mar.

A procedure was desired for the preparation of thin, uniform, and adherent films of Pu on Pt disks. Radioactive films meeting these requirements were to be used in instrumental analysis, where the self-absorption and straggling of α particles might present a serious source of error. An electrodeposition technique was found to be very satisfactory, and a quantitative procedure was developed, whereby uniform, adherent films of PuO_2 were deposited on Pt disks. Quantities of Pu, from tracer amounts to 9 mg, have been deposited completely from solutions in 2 hr. The application of improved ionization chambers, range chambers, and fission counters to radiochemical research necessitates the utilization of thin, uniform, radioactive films. Films which are thick and clumped absorb α particles to the extent that erroneous results may be obtained. α-energy analysis gave evidence that there is a minimum of self-absorption and straggling in films prepared by electrodeposition. Such films are particularly suited for isotopic analysis, by range-chamber and fission-chamber methods, as well as for preparation of counting standards. (auth)

2611

SPECTROPHOTOMETRIC STUDIES ON COMPLEX FORMATION WITH SULFOSALICYLIC ACID. V. WITH ALUMINUM(III) AND NICKEL(II). Mary Beth Lasater and Robbin C. Anderson. J. Am. Chem. Soc. 74, 1429-32(1952) Mar. 20.

The reaction between Al(III) and sulfosalicylate ions has been studied by use of the 1 : 1 Cu(II) complex with sulfosalicylate as an indicator. In the pH range in which such measurements can be made, Al(III) and sulfosalicylate were found to react in a 1 : 1 ratio. Spectrophotometric measurements show that Ni(II) and sulfosalicylate ions react in a 1:1 ratio between pH 5 and 9 to form a complex. There are some indications of one or more different complexes forming above pH 7, but evidence for these is not conclusvie from the spectrophotometric data. (auth)

2612

SPECTROPHOTOMETRIC DETERMINATION OF ZIRCONIUM. E. W. Kiefer and D. F. Boltz. Anal. Chem. 24, 542-4(1952) Mar.

The need for a method of determining small amounts of Zr prompted this investigation, the ultimate objective being the development of a spectrophotometric method. It was found that Zr could be precipitated by the addition of a standard phosphate solution and that the concentration of the supernatant phosphate solution following centrifugation decreased in proportion to the amount of Zr present. The phosphate was determined spectrophotometrically as the molybdiphosphoric acid complex. The concentration range is 1 to 80 ppm of Zr using 1-cm cells. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2613

Atomic Energy Research Establishment, Harwell, Berks (England)

THE PREPARATION OF URANIUM CRYSTALS, by R. W. Cahn. Nov. 12, 1951. 22p. (AERE M/R-744)

Applications of the strain-anneal and phase-change methods to the growth of alpha uranium single crystals in two grades of uranium are described. While the strain-anneal method gave crystals which were structurally perfect, none were more than 2½ mm in diameter, probably owing to the occurrence of twinning during deformation. By the phase change method large, but imperfect, grains were obtained. An improved strain-anneal program is suggested for future investigations. The report includes an extensive account of the determination of the orientations of alpha uranium crystals from back reflection Laue x-ray photographs, and a short list of interplanar angles.

DEUTERIUM AND DEUTERIUM COMPOUNDS

2614

THE CATALYTIC DEUTERATION OF ORGANIC COMPOUNDS. PART II. THE DEUTERATION OF CHOLESTEROL AND ERGOSTEROL. J. Bell and S. J. Thomson. J. Chem. Soc., 576-80(1952) Feb.

Deuteriocholesterol and deuterioergosterol have been prepared under comparable experimental conditions by Bloch and Rittenberg's method, i.e., a platinum-catalyzed exchange reaction between the sterols and D_2O. A reaction involving the migration of double bonds has been shown to occur, by the isolation of deuteriocholest-4-en-3-one and deuterioergosterol B_1, in cholesterol and ergosterol deuterations, respectively. The role of the solvent, acetic acid and D_2O, has been studied, and the possibility of the deuteration of the acetic acid in the methyl group being an essential preliminary to sterol deuteration has been eliminated. The deuteration of cholesterol by use of an acid other than acetic together with a platinum catalyst was unsuccessful. (auth)

2615

THE CATALYTIC DEUTERATION OF ORGANIC COMPOUNDS. PART I. DEUTERATION AND DISPROPORTIONATION. J. Bell and S. J. Thomson. J. Chem. Soc., 572-5(1952) Feb.

Block and Rittenberg's method of preparing deuteriocholesterol by a Pt-catalyzed exchange reaction between the sterol and D_2O has been applied to a series of simpler compounds, namely, cyclohexane, n-hexane, cyclohexanol, 1,3-cyclohexadiene, 1-pentene, 2-octene, 1-octene, 1,4-cyclohexadiene, benzene, and cyclohexene. Each contained representative features of sterol molecules, and the deuteration results have allowed these compounds to be placed in order of increasing facility of exchange. Considerable amounts of D were found in the products when the original compounds underwent a disproportionation reaction in D_2O.

FLUORINE AND FLUORINE COMPOUNDS

2616

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF DIATOMIC FLUORINE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Feb. 1, 1952. 21p. (NBS-1435; U21189)

A brief discussion on emission and absorption spectroscopy indicates the limitations of these methods as sources of structural information on F_2. Ideal gas thermal properties were calculated for diatomic fluorine based on vibration and rotation constants reported by Andrychuk. A Morse function was used to obtain anharmonicity and vibration-rotation coupling coefficients. Heat capacity, entropy, heat content and free energy functions are tabulated in dimensionless units at closely spaced temperature intervals from 50 to 5000°K. A table of previously reported values for the dissociation energy of fluorine is given with a brief commentary on the early work. New data by Doescher for the equilibrium $F_2 = 2F$ is discussed. A value for the dissociation energy, $36.5 = \pm 1.0$ kcal/mole, based on Doescher's equilibrium constants has been selected. This was used to obtain the heat formation of ClF, 13.2 ± 2 kcal/mole. (auth)

2617

Oak Ridge National Lab., Y-12 Area

PREPARATION OF ZIRCONIUM TETRAFLUORIDE; PROGRESS REPORT I, by J. L. Williams and Boyd S. Weaver. June 15, 1950. Decl. with deletions Mar. 25, 1952. 16p. (AECD-3329; Y-619)

Anhydrous zirconium tetrafluoride, free from significant amounts of oxygen and other impurities, has been prepared by hydrofluorination of ignited zirconium oxide, followed by sublimation of ZrF_4 away from any unreacted material. Limitations of method and suggested future work are discussed. (auth)

2618

THE USE OF CHLORINE TRIFLUORIDE AS A FLUORINATING AGENT. Eugene G. Rochow and Ira Kukin. J. Am. Chem. Soc. 74, 1615-16(1952) Mar. 20.

Preparation of CoF_3, NiF_2, and AgF_2 by the reaction of ClF_3 on $CoCl_2$, $NiCl_2$, and AgCl is described. Attempts to fluorinate hydrocarbons by this method are discussed. A repetitive batch process is necessary.

LABORATORIES AND EQUIPMENT

2619

Hanford Works

AN AUTOMATIC TITRATOR USING ELECTROLYTICALLY GENERATED TITRANTS, by W. N. Carson, Jr. Dec. 3, 1951. Decl. with deletions Mar. 24, 1952. 31p. (AECD-3343; HW-22780)

Design and construction data for an autotitrator using electrolytically generated titrants are presented. The titrator was designed for microtitration but most of the components could be used for macrotitrations as well.

RADIATION CHEMISTRY

2620

Canisius Coll.

THE RADIATION DECOLORIZATION OF DILUTE DYE SOLUTIONS; CHLOROPHENOL RED, by Edward N. Weber and Robert H. Schuler. Feb. 1952. 19p. (NYO-3260)

The kinetics of the decolorization processes induced in dilute aqueous solutions of chlorophenol red by x radiation of 120-kev energy has been investigated. These reactions provide a good model for the radiation chemistry of enzyme and related systems. (auth)

2621

Brookhaven National Lab.
ISOTOPIC EXCHANGE BETWEEN THE VALENCE STATES OF MERCURY, by Richard L. Wolfgang and Richard W. Dodson. [nd] 28p. (BNL-1126)

The exchange reaction between Hg(I) and Hg(II) in perchlorate solutions has been investigated using picrolonic acid as a precipitant. Complete exchange was found within the time required for separation, in agreement with earlier measurements, and in accord with calculations on the rate of the reversible dismutation of mercurous ion. If an approximately equivalent amount of cyanide is added to the Hg(II), the exchange rate becomes slow and measurable. The order with respect to Hg(I) was found to be 1.08 ± 0.10, with respect to Hg(II) 0.94 ± 0.07. In the range $CN^-/Hg(II)$ 0.5 to 1.8 the rate varies by a factor of two with cyanide concentration, and is not sensitively dependent on pH in dilute acid solution. The specific rate constant for a solution containing equivalent quantities of Hg(II) and cyanide is 0.34 $f^{-1}min^{-1}$ at 0°C, and the experimental activation energy is 14 kcal/mole. (auth)

2622

THE PHYSICOCHEMICAL LAWS ON THE SCALE OF INFINITELY SMALL QUANTITIES. M. Haïssinsky. Bull. soc. roy. sci. Liège. 20, 591-605(1951) Aug.-Sept.-Oct. (In French)

Reaction velocities, complex formation, solvent partition, radiocolloid formation, syncrystallization, adsorption, and electrochemistry of infinitely diluted substances, such as tracers, are discussed briefly.

2623

RADIOACTIVITY APPLIED TO CHEMISTRY. A. C. Wahl and N. A. Bonner. New York, John Wiley and Sons, Inc., 1951. 619p.

A review of this book appeared in Am. J. Phys. 20, 117-18(1952) Feb. and is reproduced here in part. The book is divided into two parts, the first of which consists of ten chapters concerned with the principles and ideas involved in the application of radioactivity to chemical research. The topics, each of which was covered by a competent authority, are: isotope exchange reactions, radioactivity applied to chemical kinetics, radioactivity applied to structural chemistry, radioactivity applied to self-diffusion studies, radioactivity applied to analytical chemistry, behavior of carrier-free tracers, radioactivity applied to the investigation of the newer elements, chemical phenomena accompanying nuclear reactions (hot-atom chemistry), emanation methods, and radioactivity applied to surface determinations. The second portion of the book contains 178 pages of tables covering factual information needed to apply the principles discussed in the ten chapters.

RADIATION EFFECTS

2624

Army Medical Research Lab.
THE EFFECT OF ULTRAVIOLET RADIATION ON SULFHYDRL AND DISULFIDE CONTAINING AMINO ACIDS, by Klaus Schocken. Jan. 2, 1952. 5p. (AMRL-73)

It was shown that ultraviolet irradiation of sulfhydryl- and disulfide-containing amino acids caused the oxidation of cysteine to cystine and the reduction of cystine to cysteine. In addition, decomposition took place, which became more pronounced on prolonged irradiation. Methionine was destroyed and homocystine was reduced to homocysteine.

2625

THE OXIDATION OF FERROUS SULPHATE SOLUTIONS BY γ-RAYS—THE ABSOLUTE YIELD. T. J. Hardwick. Can. J. Chem. 30, 17-22(1952) Jan.

The absolute value of the yield of ferric ion on the irradiation of ferrous sulphate in 0.80N sulfuric acid by γ rays has been determined using the Bragg-Gray cavity principle. Sources of error in the measurements were reduced as much as possible. The yield obtained, 20.8 ± 0.3 ferric ions per 100 ev absorbed, agrees well with Miller's value (J. Chem. Phys. 18, 79(1950)) of 20.7 molecules per 100 ev. (auth)

2626

INVESTIGATION OF THE FORMS OF PHOSPHORUS IN NEUTRON-BOMBARDED PHOSPHATES; NATURE OF THE PHOSPHORUS-32. J. G. A. Fiskell, W. A. DeLong, and W. F. Oliver. Can. J. Chem. 30, 9-16(1952) Jan.

Evidence concerning the forms of P^{32} occurring in neutron-bombarded calcium phosphates has been obtained using carrier ions for the different forms, and estimations of the proportional amounts present in these forms have been made. Ortho-, hypo-, pyro-, and metaphosphate forms of P^{32} have been found as activity in the precipitation of the respective carriers; hypophosphate appeared to be an invariable and major component. (auth)

2627

THE ACTION OF IONIZING RADIATIONS AND OF RADIOMIMETIC SUBSTANCES ON DEOXYRIBONUCLEIC ACID. PART IV. THE PRODUCTS OF THE ACTION OF DI-(2-CHLOROETHYL)METHYLAMINE. E. M. Press and J. A. V. Butler. J. Chem. Soc., 626-31(1952) Feb.

An examination has been made of the products formed when di-(2-chloroethyl)methylamine acts in dilute sodium hydrogen carbonate solutions on deoxyribonucleic acid of calf thymus. The main analytical difference between the product and the original nucleci acid is a decrease in the amount of primary amino-nitrogen and in that of purine nitrogen, precipitable as purine silver salt after hydrolysis with dilute sulfuric acid. The latter is appreciably greater than the total decrease of primary amino-nitrogen. Experiments have also been made on the action of the base on certain ribonucleosides. (auth)

2628

THE REDUCTION OF CERIC SULPHATE SOLUTIONS BY IONIZING RADIATION. T. J. Hardwick. Can. J. Chem. 30, 23-38(1952) Jan.

The yield of cerous ions formed in the reduction of ceric ion in sulfuric acid solutions by x and γ radiation is independent of cerous and ceric ion concentration, the energy of the radiation, the rate of energy absorption over a wide range, the acid concentration, and the presence of oxygen. A small negative temperature coefficient has been observed. The over-all stoichiometric equation is

$$4Ce^{+4} + 2H_2O \rightarrow 4Ce^{+3} + 4H^+ + O_2.$$

Hydroxyl radicals postulated to be produced by the radiation form water and oxygen gas. The lower limit of concentration independence is below 2×10^{-6} moles per liter. (auth)

2629

RADIATION CHEMISTRY INVESTIGATION OF AQUEOUS SOLUTIONS USING P^{32} AND S^{35} AS INTERNAL SOURCES. T. J. Hardwick. Can. J. Chem. 30, 39-46(1952) Jan.

The oxidation of ferrous ion and the reduction of ceric ion in 0.80N sulfuric acid by electrons from dissolved P^{32} and S^{35} have been studied. The chemical yields (chemical change per unit energy absorbed) obtained agree well with those obtained using x or γ radiation. The yield is independent of electron energy above about 5 kev. The results show that chemical dosimetry methods may be used for the accurate determination of energy absorption for electron energies as low as 45 kev or x rays of 200 kev. (auth)

2630

THE ACTION OF X-RAYS ON FERROUS AND FERRIC SALTS IN AQUEOUS SOLUTIONS. T. Rigg, G. Stein, and J. Weiss. Proc. Roy. Soc. (London) 211A, 375-98(1952) Mar. 6.

The action of x-rays on the ferrous-ferric system has been studied under a variety of conditions. The H atoms and OH radicals formed primarily by the action fo the radiation on the water react according to $Fe^{+3} + H \rightarrow Fe^{+2} + H^+$ and $Fe^{+2} + OH \rightarrow Fe^{+3} + OH^-$. Experiments carried out in the presence of molecular H_2, where the latter reaction competes with the reaction $H_2 + OH \rightarrow H_2O + H$, permit us to deduce that the specific rate constant of the reaction between OH radicals and ferrous ions is about five times greater than that of the corresponding reaction with hydrogen molecules. The study of the pH dependence of the reaction has led to the assumption that molecular hydrogen ions, $H^+_{2(hydr)}$, intervene in this process undergoing the reaction $Fe^{+2} + H^+_{2(hydr)} \rightarrow Fe^{+3} + H_2$, and that these ions exist in the equilibrium: $H + H^+_{(hydr)} \rightleftharpoons H^+_{2(hydr)}$. Experimental evidence and some theoretical considerations which have led to the assumption of H_2^+ in aqueous systems have been discussed in detail. In the presence of molecular O_2 the H atoms react according to $H + O_2 \rightarrow HO_2$, followed by reactions of the latter radical (cf. Haber & Weiss 1934). A comparison of the experimentally determined yields under different conditions with the absolute (chemical) yields as derived from the proposed mechanism has led to the estimation of the energy (W_{H_2O}) required for the production of a radical pair (H + OH) by the action of x rays on water. This has been found to be $W_{H_2O} = 19{\cdot}4 \pm 0{\cdot}4$ ev. (auth)

2631

PRIMARY RADIATION YIELD IN LIQUID WATER. F. S. Dainton and J. Rowbottom. Nature 169, 370-1(1952) Mar. 1.

The efficiency G_1, the number of H_2O molecules decomposed per 100 ev of energy absorbed, has been determined by radiolysis of extremely pure aqueous H_2O_2 solutions to be 13.4 ± 2.2. The chain-reaction mechanism is discussed briefly.

RARE EARTHS AND RARE-EARTH COMPOUNDS

2632

Argonne National Lab.

STUDIES OF THE SOLVENT EXTRACTION BEHAVIOR OF THE TRANSITION ELEMENTS; I. FRACTIONATION OF THE TRIVALENT RARE EARTHS, by D. F. Peppard, J. P. Faris, P. R. Gray and G. W. Mason. Jan. 17, 1952. Decl. Mar. 21, 1952. 48p. (AECD-3327; ANL-WMM-927)

The order of increasing extractability of the lanthanides into tributyl phosphate from hydrochloric acid and from nitric acid of moderate to high concentration increases with increasing atomic number, paralleling the theoretical order of decreasing basicity. This order is inverted for the case of dilute nitric acid. Yttrium falls in the position predicted from consideration of ionic radii. The logarithms of the distribution ratios of a given pair of lanthanides diverge with increasing acidity for relatively concentrated nitric acid solutions, so that the theoretical maximum mutual separation of the pair requires the use of concentrated nitric acid. Use of an inert diluent for the tributyl phosphate decreases the extractability of the rare earths by a factor much larger than that predicted on the assumption of simple dilution. The lanthanides may be divided into two groups, the split occurring at any predetermined point, by control of process variables in countercurrent fractionation. The lanthanides, yttrium, and scandium may be purified with respect to many common impurities by extraction from a salted phase. Scandium may be separated from the lanthanides and yttrium by extraction from hydrochloric acid. (auth)

SEPARATION PROCEDURES

2633

Oak Ridge National Lab.

RADIOCHEMICAL PILOT PLANT DEVELOPMENT AT THE OAK RIDGE NATIONAL LABORATORY, by H. K. Jackson and J. W. Ullmann. Feb. 4, 1952. Decl. Mar. 13, 1952. 22p. (AECD-3338; CF-52-2-19)

The place of radiochemical processing in the atomic energy program and some features of radiochemical processing in general (types of feed materials, product specifications, and health physics considerations) are discussed. The ORNL pilot plant facilities and typical engineering problems associated with it are described.

2634

Los Alamos Scientific Lab.

OBSERVATIONS ON CURIUM VALENCE STATES; A RAPID SEPARATION OF AMERICIUM AND CURIUM, by S. E. Stephanou and R. A. Penneman. Feb. 4, 1952. Decl. Mar. 26, 1952. 5p. (AECD-3339; LADC-1114)

No evidence for the existence of Cm(IV), (V), or (VI) was found in the oxidation of Cm(III)-Am(III) mixtures in either acid or alkaline media under conditions where Am(III) yielded Am(VI) or Am(V) quantitatively. Consequently, the oxidation of Cm(III) to Cm(IV), (V), or (VI) is at least more negative than the corresponding americium couples. The Cm(III)-(VI) couple is probably more negative than −2 volts (the peroxydisulfate-argentic couple). A rapid separation method based on the precipitation of CmF_3 from Am(VI) was developed. For macro amounts of Cm, CmF_3 is precipitated without carrier, leaving Am(VI) in the supernatant; for amounts of Cm where the solubility of CmF_3 is a limiting factor, LaF_3 carrier is used. Where La is introduced as carrier for CmF_3, a later purification from this element must be performed. This is readily accomplished by means of a column elution using 13 f HCl. Where no La carrier was used, the solubility of CmF_3 was found to be ~12 μg/ml. (auth)

2635

Atomic Energy Research Establishment, Harwell, Berks (England)

A ROCKING AUTOCLAVE FOR THE EXTRACTION OF PHOSPHORUS 32 FROM PILE-IRRADIATED SULPHUR AT THE CURIE LEVEL OF ACTIVITY, by W. J. Arrol. Nov. 12, 1951. 8p. (AERE I/R-822)

The rate of extraction of P^{32} from molten irradiated sulfur under pressure with 0.2N HNO_3 depends on efficient stirring of the two liquids. The autoclave found to be most satisfactory for the extraction consisted of an inner vessel of pyrex heated in an outer stainless-steel pressure vessel similar in design to a domestic pressure cooker, but with trunnions attached enabling it to be rocked through an adjustable angle. Diagrams of the autoclave are shown, and the stages in an extraction are described in detail.

2636

A NEW SOLVENT EXTRACTION METHOD FOR THE SEPARATION OF NIOBIUM AND TANTALUM. G. W. Leddicotte and F. L. Moore. J. Am. Chem. Soc. 74, 1618(1952) Mar. 20.

Nb can be extracted essentially quantitatively from strong (~8 M) HCl with a solution of methyldioctylamine in xylene. Extraction of Ta is negligible. The Nb may be stripped from the organic phase with HNO_3, H_2SO_4, or dilute HCl. The effect of HCl concentration was determined with Nb^{95} and Ta^{182} tracers.

SPECTROSCOPY

2637

Engineering Research Inst., Univ. of Mich.

INTERIM REPORT NO. 1; SPECTROCHEMICAL ANALYSIS OF TITANIUM METAL AND ALLOYS, by J. H. Enns. November 1951. 21p. (NP-3653)

The general objectives of this project are to study excitation and analytical methods best suited to metallic samples, porous-cup solutions technique, and solid-fusion mixtures. The well-known segregation property of titanium metals is one reason for the interest in sampling methods other than direct excitation of metals. Spark and a-c arc excitation of metal samples have been experimented with and the spark parameters selected to study the samples quantitatively. The arc was first employed to obtain semiquantitative estimates of elements other than the major alloying constituents. A quantitative analysis for a few elements has been made in the chemical laboratory. Spark-spectroscopy methods were then employed to prepare analytical curves. The various procedures of the porous-cup solution technique have been carried through. Some quantitative results for solutions prepared from metal samples are included. Chemical procedures for placing TiO_2 in solution have been considered. The solid-fusion mixture technique was tried with two different fusion chemicals. No quantitative results from this method are available. Instrumentation for study of excitation in inert-gas atmospheres has been completed. Some observations on this type of excitation are discussed. All radiation measurements so far have been for the spectral region between 2500 and 3250 A. Since all the more important elements have useful lines in this region, changing the prism spectrograph settings has so far not been necessary. At some later time the complete emission range is to be included. (auth)

2638

APPLYING SPECTROCHEMICAL ANALYSIS TO 2M PERCHLORIC ACID SOLUTIONS. John G. Conway and Milton F. Moore. Anal. Chem. 24, 610(1952) Mar.

The main difficulty in the spectrographic analysis of $HClO_4$ solutions is the chemical reaction between the acid, and the electrodes. The use of Cu electrodes painted with Prufcoat and dried in vacuum has proved satisfactory. The protective coat increases the background to some extent.

SYNTHESES

2639

Brookhaven National Lab.

THE FORMATION OF AMINO ACIDS FROM CARBOHYDRATE CARBON IN THE MOUSE, by Robert Steele. [nd] 19p. (BNL-1133)

The essential amino acids valine, isoleucine, lysine, histidine, phenylalanine and threonine are not formed at all from carbohydrate carbon in the mouse. The amino acids arginine, proline, glycine, cystine and serine are formed from carbohydrate carbon at rates considerably lower than the rates at which aspartic acid, glutamic acid, and alanine are formed. Methionine incorporates carbohydrate carbon at a rate consistent with the proposition that only the CH_3 group is involved in this process. Tyrosine is not formed at all from carbohydrate carbon in the mouse; no doubt tyrosine is derived solely from ingested phenylalanine. (auth)

2640

Oak Ridge National Lab., Y-12 Area

PREPARATION OF ZIRCONIUM TETRAFLUORIDE; PROGRESS REPORT II, by Joe L. Williams. Feb. 15, 1951. Decl. with deletions Mar. 24, 1952. 14p. (AECD-3335; Y-769)

The existence of the compound $ZrOF_2$ has been confirmed and it was determined that it can be formed by the action of gaseous ZrF_4 on ZrO_2. A mixture of these compounds will react at a temperature greater than 550°C to give the $ZrOF_2$. The $ZrOF_2$ may be partially hydrofluorinated to ZrF_4, the reaction being most efficient at 550°C. Zirconium oxide which has been ignited at 800°C will not completely hydrofluorinate to ZrF_4. The maximum degree of conversion is approximately 96% and the reaction is most efficient at 550°C. It is extremely difficult to prepare perfectly pure ZrF_4, even when sublimation in vacuo is carried out to assure separation from oxygen-bearing material. Good separation can be obtained only by the use of an adequate baffle system in the sublimer to prevent entrainment. (auth)

2641

SYNTHESIS OF ORGANIC DEUTERIUM COMPOUNDS. II. PROPYNE-3-d_3 AND PROPYNE-d_4. L. C. Leitch and R. Renaud. Can. J. Chem. 30, 79-83(1952) Feb.

A procedure is described for preparing magnesium carbide, Mg_2C_3, in 300-g lots from Mg and pentane vapor. Propyne-d_4 was prepared in good yields by the action of D_2O oxide on this carbide. The acetylenic deuterium in propyne-d_4 was replaced by hydrogen via the mercury derivative giving propyne-3-d_3. The vapor pressures of propyne-3-d_3 and propyne-d_4 were determined between −25 and −60°C. (auth)

TRACER APPLICATIONS

2642

Brookhaven National Lab.

THE GROSS MECHANISM OF THE VICTOR MEYER AND HARTMANN REACTION, by Aksel A. Bothner-By and C. Wheaton Vaughan, Jr. [nd] 9p. (BNL-1134)

The reaction between an aryliodoso compound and an aryliodoxy compound in the presence of alkali to yield a diaryliodonium iodate has been termed the Victor Meyer and Hartmann reaction. In an effort to obtain some evidence bearing on the question of the mechanism iodosobenzene-I^{131} and iodoxybenzene have been alloyed to react in the presence of alkali to yield diphenyliodonium iodate. It has been shown that the radioactivity of the product occurs almost exclusively in the diphenyliodonium ion. A mechanism which is consistent with this and other previous observations is suggested for the reaction.

2643

RADIOCHEMICAL MEASUREMENTS OF ACTIVITY COEFFICIENTS IN MIXED ELECTROLYTES. R. H. Betts and Agnes N. MacKenzie. Can. J. Chem. 30, 146-62(1952) Feb.

A method is described for the precise measurement of the activity coefficients of salts in mixed electrolytic solutions. It involves the use of synthetic ion exchange resins and radioactive tracers. The activity coefficients of the chlorides of Na, K, Rb, and Cs were measured at effectively zero concentration in hydrochloric acid solutions from 0.005 to 1.5 M. The activity coefficient of sodium chloride in solutions of lithium and potassium chlorides was also determined. The results are discussed in terms of both the Harned rule and the Stokes-Robinson theory of activity coefficients. (auth)

URANIUM AND URANIUM COMPOUNDS

2644

Argonne National Lab.

SPECTROPHOTOMETRIC DETERMINATION OF URANIUM BY THIOCYANATE METHOD IN ACETONE MEDIUM, by Carl E. Crouthamel and Carl E. Johnson. Feb. 1952. Decl. Mar. 21, 1952. 16p. (AECD-3328; ANL-HDY-701)

A method which is relatively free from both anionic and cationic interferences has been developed for the determination of uranyl ion. About 0.01 mg U/l will develop an absorbance of about 0.20 in one centimeter cells. The molar absorbance index is approximately 3850. Relatively large amounts of Cu, Zr, Sn, Hg, Mn, sulfate, fluoride, acetate, chloride and nitrate do not interfere. More than unit molar ratios of foreign ion/uranyl ion may be present if the foreign ion is fluosilicate, phosphate, citrate, Ni, Cr and Fe. Pb, Co, and Mo interfere at low concentrations. The use of an acetone water media lead to a marked decrease in anion interferences and an increased absorbance index at lower thiocyanate concentrations. Data are given on: absorbancy of standard uranyl ion solutions developed according to the standard thiocyanate-acetone procedure; absorbancy of cations in standard acetone-thiocyanate medium; fluorescence of uranyl thiocyanate complexes; and interference of fluosilicate on uranyl thiocyanate colorimetric procedures.

ENGINEERING

2645
General Engineering Lab., General Electric Co.
ANALYSIS OF JOURNAL BEARING THEORY AND TEST RESULTS, by Harry Apkarian. Mar. 1, 1952. 29p. (R52GL50)

This report contains a theoretical analysis of journal bearing behavior and a correlation of theory with test results obtained. There is only qualitative agreement between journal bearing theory and test results. Quantitative agreement is limited by shortcomings in theory, analytical solutions, and experimental techniques. Further investigation of dimensionless lubricant flow factors and other conditions which influence bearing behavior is necessary to establish better correlation between theory and practice. (auth)

2646
General Engineering Lab., General Electric Co.
DEVELOPMENT OF SLEEVE BEARING TEST EQUIPMENT, by Harry Apkarian. Mar. 1, 1952. 14p. (R52GL52)

A bearing tester is described which is capable of producing the following test conditions without interfering with the friction torque measurements: loads up to 600 lb, regulation of shaft speeds within 0.1% over the range 1000 to 5000 rpm, lubricant feed pressure from 0 to 50 psig, and provisions for making submerged lubrication bearing tests. The equipment includes means for measuring the bearing friction torque, applied load, shaft rotative speed, lubricant temperature, lubricant flow rate, and lubricant pressure. Bearings with bore diameters ranging from ½ to 1½ in. and length-to-diameter ratios from 1 : 3 to 3 : 1 may be accommodated by the tester. Schematic drawings, a photograph, and calibration curves are included.

2647
Stanford Univ.
GAS TURBINE REGENERATOR DESIGN STUDIES, by W. M. Kays and A. L. London. Dec. 15, 1949. 39p. (NP-3153; Technical Report No. 8)

HEAT TRANSFER AND FLUID FLOW

2648
Stanford Univ.
THE HEAT TRANSFER AND FLOW FRICTION PERFORMANCE OF THREE COMPACT PLATE-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Dec. 1, 1949. 40p. (NP-3154; Technical Report No. 7; U21185)

This report contains the results of basic heat transfer and flow friction tests of three compact high-performance plate-fin-type heat transfer surfaces. One surface is of strip or serrated fin construction while the other two have wavy or ruffled fins. The heat-transfer and flow-friction characteristics, respectively, are given in both tabular and graphical form using the conventional dimensionless correlations employing the Stanton (h/Gc_p), Prandtl ($\mu c_p/k$), Fanning friction factor (f), and Reynolds ($4r_h G/\mu_f$) numbers in the form, $(h/Gc_p)Pr^{2/3}$ and f versus $(4r_h G/\mu_f)$. The heat transfer-friction power characteristics, evaluated at specified standard gas properties (air at 1 atm. and 500°F) are presented on both a unit area and a unit volume basis. The test results show that the wavy or ruffled fin surface is competitive with the completely interrupted fin surface from the heat transfer—friction power point of view and therefore may be an attractive surface for applications where high performance is desired but fouling is a major consideration. However, this opinion requires verification by tests at actual or simulated service conditions. The strip fin surface exhibits the characteristics of short flat plates with laminar boundary layer, and the ruffled fin surfaces exhibit similar characteristics indicating the build-up of a laminar boundary layer on the fins between changes in fin direction. (auth)

2649
Lewis Flight Propulsion Lab., NACA
FORCED-CONVECTION HEAT TRANSFER TO WATER AT HIGH PRESSURES AND TEMPERATURES IN THE NONBOILING REGION, by S. J. Kaufman and R. W. Henderson. Nov. 29, 1951. 16p. (NACA-RM-E51I18)

Forced-convection heat-transfer data have been obtained for water flowing in an electrically heated tube of circular cross section at water pressures of 200 and 2000 pounds per square inch, and temperatures in the nonboiling region, for water velocities ranging between 5 and 35 feet per second. The results indicate that conventional correlations can be used to predict heat-transfer coefficients for water at pressures up to 2000 pounds per square inch and temperatures in the nonboiling region. (auth)

2650
Stanford Univ.
THE PERFORMANCE OF FINNED-CIRCULAR-TUBE HEAT EXCHANGER SURFACES, by D. W. Johnson. Jan. 1, 1951. 22p. (NP-3155; Technical Report No. 12)

This report contains the results of basic heat transfer and flow friction tests of three finned-circular-tube heat exchanger surfaces in which the only geometrical variable is the fin spacing. The circular tube OD is 0.380 inches, the circular fin OD is 0.975 inches, and the spiral fins have pitches of 7.34, 8.72, and 11.46 fins per inch, respectively. In the three test cores the circular tubes were staggered on a diamond layout, and the test core flow length was five tube rows deep. Surfaces of this type have possible application to the gas turbine intercooler and the liquid-coupled indirect-transfer regenerator, as well as other applications where heat must be transferred between a gas and a liquid or a gas and a condensing or evaporating fluid. The heat transfer and flow friction characteristics, respectively, are given in both tabular and graphical form. The heat transfer coefficient versus friction power characteristics of the surfaces, evaluated at specified standard gas properties (air at one atm. and 500°F) are also presented graphically and in tabular form. (auth)

2651
Massachusetts Inst. of Tech.
SHEAR FLOW IN BENDS, by W. R. Hawthorne and Hans P. Eichenberger. Mar. 1, 1951. 7p. (NP-3167; Technical Report No. 1)

In calculations of the flow through turbo machinery, potential flow is usually assumed. This is a good approximation if the Reynolds number is high, but for an average Reynolds number the secondary losses due to a deviation of the velocities from the ideal ones are considerable. This deviation of the actual flow from the potential flow is treated mathematically for the case of a bend with square cross section with a straight pipe before and after it.

2652

THE THERMAL CONDUCTIVITY OF METALS AT HIGH TEMPERATURE. C. L. Hogan and R. B. Sawyer. J. Applied Phys. 23, 177-80(1952) Feb.

The Forbes bar method has been modified and adapted to the problem of measuring the thermal conductivity of metals and alloys in the temperature range from 25 to 1000°C. A mathematical analysis is presented which indicates the error involved by assuming plane isothermals in the sample. The electrical and thermal conductivities of commercial "A" nickel, inconel, several stainless steel alloys, and 1010 steel are reported, and the results are compared, qualitatively at least, with the theory presented by Wilson and Makinson. (auth)

PUMPS

2653

Knolls Atomic Power Lab.

OPERATION AND ANALYSIS OF A 100-PSI ELECTROMAGNETIC PUMP, by G. D. Collins. Jan. 19, 1952. 74p. (KAPL-668)

This report gives a description of a small round induction-type electromagnetic pump suitable for use in a completely sealed hydraulic piston positioning system using sodium as the fluid. The estimated performance curves, calculated from equivalent circuit theory, are presented with actual test data for comparison. A method of calculating the values of the equivalent circuit from input measurements is also presented and discussed. The pump performance was very poor on sodium-potassium alloy, due to test loop contamination by carbon. When tested with clean sodium, the performance agreed within 15% with that predicted by calculation. (auth)

2654

Atomic Energy Research Establishment, Harwell, Berks (England)

THE EFFECT OF FRICTION ON THE FLOW IN VANELESS DIFFUSOR SPACE OF CENTRIFUGAL COMPRESSORS, by J. Woodrow. January 1952. 13p. (AERE E/R-817)

The effect of wall friction on the outward spiral vortex flow of a compressible fluid is investigated, in order to assist in the design of centrifugal compressors. Assuming uniform and axially symmetric flow, a constant friction factor and small spiral angle, a second order differential equation is obtained, which can be solved numerically, given the flow conditions at the impellor tip. The conditions of the flow at any radius can then be calculated. The flow pattern and performance of the vaneless diffusor is found to depend on four non-dimensional parameters. By considering the flow in the neighborhood of a point a simple expression for the local adiabatic efficiency was obtained. The equation for the flow was also integrated numerically. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

2655

Massachusetts Inst. of Tech.

FINAL REPORT ON DEVELOPMENT OF METAL-CERAMIC COMPOSITIONS SUITABLE FOR SERVICE AT ELEVATED TEMPERATURES, by W. D. Kingery, G. Economos, M. Humenik, Jr., and M. Berg. Apr. 30, 1951. 54p. (NEPA-1848)

Data are reported from fundamental investigations of the properties of metal-ceramic compositions suitable for service at elevated temperatures. Metals investigated were Si, Be, Ni, and Fe. Ceramic materials employed were Al_2O_3, ZrO_2, MgO, BeO, Be_2C, TiO_2, and graphite. Data on surface tension, wettability, interface reactions, and sintering are included.

2656

Lewis Flight Propulsion Lab., NACA

ELEVATED TEMPERATURE PROPERTIES OF TITANIUM CARBIDE BASE CERAMALS CONTAINING NICKEL OR IRON, by A. L. Cooper and L. E. Colteryahn. Dec. 3, 1951. 47p. (NACA-RM-E51I10)

Elevated-temperature properties of titanium carbide base ceramals containing nickel or iron were determined in oxidation, modulus of rupture, tensile strength, and thermal-shock resistance. Metallographic structure was studied. These materials followed the general growth law and exhibited two stages in oxidation. The following tensile strengths were found at 2000°F: 13.3 weight percent nickel, 16,150 pounds per square inch; 11.8 weight percent iron, 12,500 pounds per square inch; unalloyed titanium carbide, 16,450 pounds per square inch. Nickel or iron additions to titanium carbide improved the thermal-shock resistance, nickel more. The path of fracture in tensile and thermal-shock specimens was found to progress approximately 50 percent intergranularly and 50 percent transgranularly. (NRS abst.)

CORROSION

2657

Corrosion Research Lab., Ill. Inst. of Tech.

THEORY OF CORROSION INHIBITOR ACTION, by Hugh J. McDonald, Glenn A. Marsh and Robert D. Misch. June 1948. 40p. (NP-3148; U1597)

GEOLOGY AND MINERALOGY

2658

DISCOVERY OF URANIUM IN THE PHOSPHATE DEPOSITS OF MOROCCO. Andre Lenoble, Henri Salvan, and Valery Ziegler. Comp. rend. 234, 976-7(1952) Feb. 25. (In French)

A series of measurements of the intensity of the β and γ radiation over the phosphate basins of Morocco showed that a strong radioactivity, due to U, was associated exclusively with the phosphate deposits. The intensity of the radiation was directly related to the age of the phosphate layer.

2659

ON THE PRESENCE OF SCHEELITE AND NATIVE GOLD AND THEIR MODES OF DEPOSITION IN THE EASTERN RIM OF THE GRANITO-DIORITIC MASSIF OF TICHKA (HIGH ATLAS, MOROCCO). Valéry Ziegler, Charles Bizard, Pierre Bourrieau, and Paul Frehring. Compt. rend. 234, 862-4(1952) Feb. 18. (In French)

Scheelite ($CaWO_4$) has been found in the region of Ikissane, Injokhra, Jebel Afadad, Agadir n'Maïne, Amsioui, and Tough el Kheir, villages on the eastern rim of the Tichka massif in French Morocco. It is found in quartz veins, garnetites, hornfels, and pyroxenes, occasionally associated with Au and U titanate.

2660

ON THE PRESENCE OF URANIUM IN THE NORTH AFRICAN PHOSPHATES. Antoine A. Guntz. Compt. rend. 234, 868-70(1952) Feb. 18. (In French)

Chemical and fluorimetric analyses of samples of North African phosphates from Tunisia to Morocco revealed an average U content (as the element) of 20 to 30 g/ton, with extremes of 10 and 50 g/ton. No samples comparable to American phosphates in richness were found.

2661

THE ISOTOPIC CONSTITUTION OF IGNEOUS SULPHUR AND THE PRIMORDIAL ABUNDANCE OF THE TERRESTRIAL SULPHUR ISOTOPES. J. Macnamara, W. Fleming, A. Szabo, and H. G. Thode. Can. J. Chem. 30, 73-6(1952) Jan.

The isotopic ratio S^{32}/S^{34} was determined mass spectrographically for six igneous rocks and 19 sulfide ores of igneous origin. The ratios for all the igneous samples agreed within 0.5% and agreed more closely with the value for meteoritic S than with ratios for S from other sources. Ratios for five of the igneous rocks agreed within 0.2%. Isotopic ratios for sulfide deposits in the Sudbury, Ontario, district were notably uniform.

METALS AND METALLURGY

2662

Fansteel Metallurgical Corp.

DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS; SIX MONTHS' INTERIM TECHNICAL PROGRESS REPORT; MAY 18, 1951 THROUGH NOVEMBER 30, 1951, by Stanley Kluz and Ralph Wehrmann. Dec. 26, 1951. 15p. (NP-3632)

The development of suitable coatings for the prevention of oxidation of Ti at elevated temperatures was investigated. A study was made of silicide coatings involving the preparation of compounds of Ti and Si and the determination of their resistance to oxidation at high temperatures plus the accumulation of x-ray and metallographic data necessary in the examination and evaluation of coatings. Titanium silicides were synthesized by heating the powders of the elements. It was found that the oxidation resistance of $TiSi_2$ was outstanding. The material underwent no significant change during 1048 hours in air at 1000°C.

2663

Illinois Univ. Engineering Experiment Station

AN ELECTRON MICROSCOPE STUDY OF THE DEVELOPMENT OF FATIGUE FAILURES, by W. J. Craig. Feb. 1952. 22p. (NP-3673; Technical Report No. 27; U21182)

Deformation characteristics of α-brass, ingot-Fe, and Al were compared for static and repeated loadings. Electron micrographs were made from negative parlodion replicas shadow-cast with Cr at an angle of about 18°. Under static loading, deformation was extensive throughout the crystalline grains; under repeated loading, deformation was highly localized in a few crystals or in parts of crystals. Fatigue failure apparently developed from localized deformation bands and followed the direction of progressive crack growth to fracture. Static and repeated loadings produced similar individual deformation marks on α-brass surfaces; ingot-Fe marks were slightly different and Al marks had markedly different appearances for the 2 types of loading. (cf. TIP U19673) (NRS abst.)

2664

Westinghouse Atomic Power Div.

THE SPECTROGRAPHIC ANALYSIS OF 18-8 STAINLESS STEEL FOR COBALT, MANGANESE AND STABILIZING ELEMENTS, by Neil E. Gordon, Jr., Ralph M. Jacobs and Marilyn C. Rickel. Jan. 11, 1952. 15p. (WAPD-T-4)

To shorten the time required for the analysis of C, Mn, Ti, Ta, Nb, and Mo in 18-8 stainless steel, a spectrographic method is described whereby these elements are determined simultaneously. A salt technique is used in conjunction with an a-c arc excitation and an accuracy of 15% is obtained. The method is particularly applicable where samples of diversified shape, size and metallurgical history are submitted. Standards can be synthesized readily from pure metals and analytical grade reagents. (auth)

2665

California Inst. of Tech.

DELAYED YIELDING IN ANNEALED MILD STEEL WITH SPECIAL REFERENCE TO YIELDING AT LOW TEMPERATURES; FOURTH TECHNICAL REPORT, by D. S. Wood and D. S. Clark. December 1951. 29p. (NP-3641; U21000)

The delay time for the initiation of yielding in an annealed low-C steel was determined as a function of the applied tensile stress at −320 and −205°F. At −320°F an upper limiting stress exists at which the delay time tends rapidly toward zero. The upper limiting stress was not attributed directly to the occurrence of brittle fracture observed in several of the tests at −320°F. The test data are compared with previous data on the same material obtained at higher temperatures. The findings are discussed in conjunction with a tentative dislocation model for the yielding process based upon the Cottrell theory of anchored dislocations and the Frank-Read static dislocation generator. (cf. TIP U19564) (auth)

2666

Cornell Aeronautical Lab., Inc.

FINAL REPORT ON HIGH TEMPERATURE TESTING OF TYPE 316 STAINLESS STEEL SHEET; NOVEMBER 1, 1950 TO JUNE 29, 1951, by G. J. Guarnieri. June 29, 1951. 38p. (AECU-1936)

A type 316 stainless steel sheet alloy has been studied with the objective of determining its load-carrying-ability in the 1200 to 1800°F temperature range. Sufficient creep and rupture tests were conducted at 1200 to 1800°F to permit the construction of stress-time design charts defining the stresses to give 1, 2, and 5% creep as well as rupture, from 1 to 1000 hours, at each of the temperatures. These data were supplemented with comparison rupture test results at 1200, 1500, and 1800°F for the same material after joining by a Heliarc welding process. The as-welded material suffered minor loss in rupture strength relative to the parent metal at 1200 and 1500°F and approximately 30% loss at 1800°F with fracture occurring in the weld joints at all temperatures. Because of the microstructural instability of the 316 steel composition upon exposure to the temperature and time conditions of interest, a metallographic study was made of completed creep test specimens and other aged specimens exposed to temperature without stress. In the design of structural components from type 316 stainless steel, 1600°F would be recommended as a conservative working temperature limit. A peak of 1800°F could be tolerated at stresses within 1000 psi where short life expectancy would be sufficient.

2667

Metals Research Lab., Carnegie Inst. of Tech.

ELECTROCHEMICAL STUDIES OF NON-AQUEOUS MELTS; QUARTERLY PROGRESS REPORT PERIOD ENDING FEBRUARY 15, 1952. Mar. 28, 1952. (NYO-828)

A four-terminal conductivity cell calibrated with standard H_2SO_4 solution and an a-c potentiometer circuit were used to make further measurements of the electrical conductivity of a molten 50 wt. % Cu_2S-FeS matte at temperatures from 1000 to 1200°C. The results are of the same order of magnitude as previously reported, about 450 $ohm^{-1}cm^{-1}$. A certain increase in electrical conductivity with temperature was measured. Data on the electrolysis of iron silicate are tabulated. A modified apparatus for measuring transport numbers is described and diagramed. A current density vs. cell voltage curve for 5 wt. % VCl_2 in molten eutectic LiCl-KCl at 415°C is shown. The data were taken under conditions of complete polarization. The decomposition potential required to deposit V from this system in the form of a fine powder is estimated to be 540 mv.

2668

Vickers—Armstrongs, Ltd. (England)
THE EFFECT OF GRAIN DIRECTION ON THE MECHANICAL PROPERTIES OF LIGHT ALLOY EXTRUSIONS, by D. M. McElhinney. [nd] 64p. (VTO/M/208; S and T Memo No. 14/51)

The results of a series of tests on specimens made from light-alloy extruded bars of large cross-sectional area are presented to show the effect of grain direction on the mechanical properties. The effect of stress concentrations on strength in the various grain directions is also shown. The influence of grain direction on lugs and pin shear is likewise indicated from test results. Recommendations are made for future designs. The loss of strength due to transverse grain is much greater than the 10% allowance assumed in the past, being in some cases as great as 35%. With stress concentrations greater than 2 the reduction in tensile strength is as much as 45%. The loss of strength appears to be associated with the small ultimate elongation, sometimes practically nil, obtained in the transverse direction. Pin-shear was not significantly affected by grain direction. The calculation of the strength of lugs is much more complex than has hitherto been assumed: the effects of grain direction on the strength of lugs is not so great as the tests on the tensile specimens would appear to indicate. A reduction of the order of 10% in the normal strength adequately covers the effect of transverse grain. It should be noted that the officially recommended method for the design of lugs overestimates the strength of lugs extracted from certain parts of the extruded bar, possibly because the variation of the mechanical properties across the bar as shown by specimens cut from the same bar in the same direction is much greater than has been expected. (auth)

2669

Battelle Memorial Inst.
INVESTIGATION OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS MADE BY POWDER-METALLURGY TECHNIQUES; SUMMARY REPORT, by W. L. Bruckart, M. H. LaChance, C. M. Craighead and R. I. Jaffee. June 30, 1951. (NP-3699)

Results of mechanical-property tests, chemical analysis, metallographic and recrystallization studies, and elevated-temperature tests are given on binary alloys of Mo. Data on alloys made with Al, B, Be, C, Cb, Co, Cr, Fe, Mn, Ni, Si, Ta, Th, and W are included. In addition, mechanical-property data are given for certain ternary combinations of Mo with Co, Cr, Fe, and Si, which were determined to be the more promising binary additions. A correlation based on the mechanical properties of the various alloys is included.

2670

Battelle Memorial Inst.
ELECTROPLATING ON ZIRCONIUM, by W. C. Schickner, J. G. Beach, and C. L. Faust. Nov. 15, 1951. Decl. Mar. 24, 1952. 27p. (AECD-3334; BMI-707)

Procedures for diffusion bonding Ni and Fe electroplates to Zr were developed. Greater emphasis was placed on bonding Ni. Electroplated metals on Zr were easily peeled, if commercial methods for plating on steel, stainless steel, Al, and Mg were used. Attempts to improve the adhesion of these electroplates to Zr by heat treatment resulted in blistering and peeling with little or no diffusion. Successful diffusion bonding of electroplated Ni and Fe to Zr is attributed to a new and specific etching and plating procedure that produced improved as-plated adhesion, indicated by a modulus of rupture of > 6,000 psi. This is approaching the adhesion of electroplated metals on Al (12,000 psi, the strength of Al). Heat treating to diffuse the Ni plate and the Zr produced bonds with a modulus of rupture averaging 55,000 psi. With minor modifications, the procedure for diffusion bonding Ni to Zr is considered usable for applying Ni to Mo, Ti, V, and Nb. (auth)

2671

THE FORMATION OF A BOUNDARY BETWEEN NORMAL-CONDUCTING AND SUPERCONDUCTING METAL. M. P. Garfunkel and B. Serin. Phys. Rev. 85, 834-40(1952) Mar. 1.

An experiment is described in which a superconducting sample is arranged so that part of it is in the normal state and part of it is superconducting. The boundary surface is thus a single, large area rather than the complicated boundaries that exist between normal and superconducting regions when a sample is in the intermediate state. We find that there is a large difference between the magnetic field at which the superconducting-normal state transition occurs and the magnetic field at which the normal-state-superconducting transition occurs. These results are in agreement with the thermodynamic theory of the phase transition. The thermodynamic theory, coupled with an assumption about the nature of the surface energy between superconducting and normal metal is used to show how the hysteresis determines the ratio of this surface energy to a characteristic dimension of the superconductor. A measure of this ratio is given in the temperature region between 3.37 and 3.68°K for superconducting tin. (auth)

PHYSICS

2672

Lewis Flight Propulsion Lab., NACA
FRICTION AND SURFACE DAMAGE OF SEVERAL CORROSION-RESISTANT MATERIALS, by Marshall B. Peterson and Robert L. Johnson. Feb. 20, 1952. 20p. (NACA-RM-E51L20)

Friction and surface damage of several materials that are resistant to corrosion due to liquid metals was studied in air. The values of kinetic friction coefficient at low sliding velocities and photomicrographs of surface damage were obtained. Appreciable surface damage was evident for all materials tested. The friction coefficients for the combinations of steel, stainless steel, and monel sliding against steel, stainless steel, nickel, inconel, and nichrome ranged from 0.55 for the monel-inconel combination to 0.97 for the stainless-steel-nickel combination; for steel, stainless steel, monel, and tungsten carbide against zirconium, the friction coefficient was approximately 0.47. Lower coefficients of friction (0.20 to 0.60) and negligible surface failure at light loads were obtained with tungsten carbide when used in combination with various plate materials. (auth)

2673

Wright Air Development Center
LINEAR NOISE SMOOTHING AND PREDICTING FILTERS, by Frank W. Bubb. May 1951. 28p. (AF-TR-6586)

2674

Radiation Lab., Univ. of Calif.
NOTE ON THE STABILITY OF LINEAR FEEDBACK SYSTEMS, by E. T. Jaynes. Feb. 27, 1952. 10p. (UCRL-1695)

The Nyquist criterion of stability in linear systems with feedback is extended to give predictions of the ringing time of a system for which the point (1,0) lies close to but outside the Nyquist diagram. The response of such a system is that of a high-Q resonant circuit. The frequency and Q of the ringing may be predicted from the Nyquist plot of the system.

2675
Watertown Arsenal
CONCERNING EXTINCTION EFFECTS IN POWDERS, by R. J. Weiss. [nd] (BNL-1132)

The effects of extinction in powders are considered. Recent x-ray-diffraction studies on metal powders have reported differences in the integrated intensities of the Debye-Scherrer rings for cold-worked and annealed samples. These differences have been attributed to both secondary extinction effects and to primary extinction. The conclusion in the present report is that on the basis of available data, one cannot distinguish between primary and secondary extinction. It is felt, however, that a distinction could be made between the two types of extinction. Since cold-worked metals exhibit a marked decrease in extinction, it appears that the mosaic block size decreases if the extinction is primary, or the reciprocal of the mosaic block misalignment decreases if the extinction is secondary.

2676
Vibration Research Lab., Stanford Univ.
RESPONSE OF A YIELDING VIBRATORY SYSTEM TO TRANSIENT FORCING FUNCTIONS (I); SINGLE-DEGREE-OF-FREEDOM SYSTEMS; STEM-WISE FORCING FUNCTIONS; PHASE-PLANE GRAPHICAL METHOD. Mar. 20, 1951. 34p. (NP-3088; Technical Report No. 11)

2677
Los Alamos Scientific Lab.
AN INVESTIGATION OF THE MAGNETIC PROPERTIES OF LIQUID He^3, by E. F. Hammel, H. L. Laquer, S. G. Sydoriak and W. E. McGee. [nd] 3p. (AECU-1928; LADC-1112)

Two methods were employed to examine the magnetic properties of liquid He^3. The first was a heterodyne beat method. At 2.08 and 1.27°K the volume susceptibility of liquid He^3 was less than 5×10^{-6}. If liquid He^3 were a nuclear ferromagnetic, long relaxation times for the He^3 atoms or domains would give a null result, as would magnetic saturation of the sample by the earth's magnetic field. A low frequency (60 cycles) method which avoided these objections, unless the relaxation time was of the order of hours, was therefore employed. At 0.904 and 135°K no change in the oscilloscope signal was observed.

2678
University of Southern Calif.
PROPERTIES OF SOLUTIONS IN THE NEIGHBORHOOD OF THE CRITICAL TEMPERATURE OF THE SOLVENT; SECOND TECHNICAL REPORT PHYSICAL SCIENCES DIVISION; COVERING PERIOD APRIL 1, 1950 - JANUARY 31, 1951, by Sidney W. Benson, Charles S. Copeland, Donald W. Fisher, James K. Fogo and Jacob Silverman. March 1, 1951. 57p. (NP-3156)

2679
Bell Telephone Labs., Inc.
THE TRANSISTOR; SELECTED REFERENCE MATERIAL ON CHARACTERISTICS AND APPLICATIONS. [nd] 792p. (NP-3589)

Theory, transistor properties, circuit design principles, application, and characteristics of different transistor types now under development are reviewed. It is the purpose of this volume to provide enough representative material to give a picture of the current status. Included are published technical articles, reports of work carried on under contracts with the military services, and supplementary memoranda.

2680
Ames Lab.
THERMAL CONDUCTIVITY OF METALS AT HIGH TEMPERATURES, by Paul H. Sidles and G. C. Danielson. Dec. 1951. (ISC-198)

A new method of measuring thermal diffusivity and hence thermal conductivity of metals is suggested. Like previously reported dynamic methods, this method uses a heat source, whose temperature varies sinusoidally, located at one end of an effectively infinite rod. Unlike these methods only one period of the heat wave is required to eliminate the unknown coefficient determining the heat lost by radiation since both velocity and amplitude decrement of the heat wave are measured. The new method is faster in taking data and simpler in computation. The thermoelectric potentials from two thermojunctions are amplified and plotted on a Brown "Electronic" recorder in order to obtain a permanent record of all necessary data for computing the thermal diffusivity. Results for copper over the temperature range 0 to 560°C and for thorium over the temperature range 0 to 430°C are given. (auth)

2681
ADIABATIC MAGNETIZATION OF SUPERCONDUCTORS. K. Mendelssohn. Nature 169, 366(1952) Mar. 1.

The magneto-caloric effect in superconductors may be used as a supplement to the paramagnetic method in obtaining and studying temperatures below 1°K. An expression for the degree of cooling obtained is derived. Use of metals with high transition and Debye temperatures, such as Ta and Nb, permits temperatures below 0.1°K to be reached. The method is particularly valuable in the region 0.3 to 1°K.

2682
ON A DEGENERACY THEOREM OF KRAMERS. Martin J. Klein. Am. J. Phys. 20, 65-71(1952) Feb.

There is a theorem due to Kramers which states that the energy states of systems with an odd number of electrons remain at least doubly degenerate in the presence of any purely electric fields. It is the purpose of the present paper to provide a discussion of the theorem and some of its consequences which may be of interest to physicists in general and of direct use to students and workers in the quantum theory of paramagnetism and low-temperature physics. The physical significance of this theorem, its proof, and a discussion of the relationship of the Kramers degeneracy and the Wigner time-reversal operation are considered. A proof is given of the theorem that the expectation value of the magnetic moment operator is zero for any nondegenerate state.

COSMIC RADIATION

2683
Engineering Research Inst., Univ. of Mich.
THE PRODUCTION OF HIGH-ENERGY SECONDARIES BY COSMIC RAYS UNDERGROUND, by W. E. Hazen. Nov. 30, 1951. 8p. (NP-3666; U21198)

The penetration of 100 m of Pb by particles was studied at an underground depth of 8.4×10^4 g/cm^2 with a cloud chamber containing 2.54-cm Pb plates. The observed probability for an energy transfer greater than 10^9 ev to the soft component was $3.0 \pm 0.7 \times 10^{-4}$/g/cm^2 of Pb. Comparison with the theoretical probability of 2.1×10^{-4}/g/cm^2 based on knock-on, bremsstrahlung, and pair-production processes indicated that these electromagnetic phenomena account for nearly all the high-energy soft secondaries produced by μ mesons of about 10^{11}-ev energy. (NRS abst.)

2684
Engineering Research Inst., Univ. of Mich.
BURST PRODUCTION IN MATERIAL OF Z-11 BY COSMIC RAYS AT SEA LEVEL, by Frank E. Driggers. November 1951. 101p. (NP-3665; U21200)

Cosmic-ray bursts under material of low atomic number (principally brick) were studied in a large ionization chamber. An integral burst size-frequency distribution was obtained by amplifying and recording the electron pulses produced by the bursts. Air-shower and nuclear-event bursts were identified by an auxiliary tray of Geiger tubes outside the absorber and by the pulse shape. Calculations were made of the expected burst distribution arising from the electromagnetic interactions of spin 0 and ½ μ mesons. Bremsstrahlung, knock-on, and direct pair-production processes were considered. The experimental results exceeded the predicted rate for spin ½ μ mesons by about 40%. This excess was tentatively attributed to nuclear interactions. The results were not compatible with the assumption of spin 0 for the μ meson. The expected Z dependence of μ-meson bursts was roughly confirmed by a comparison with results obtained under material of higher Z. (NRS abst.)

2685

Syracuse Univ.

HIGH-ENERGY NUCLEAR INTERACTIONS IN LEAD, by Fritz E. Froehlich, Erich M. Harth and Kurt Sitte. Feb. 29, 1952. 51p. (NYO-3396)

Details of cosmic-ray nuclear interactions at 3260 m and at 220 m have been studied by means of a large cloud chamber containing eight ½-in. Pb plates operated in conjunction with a 134-counter hodoscope placed directly below the chamber. It is concluded that most of the primaries recorded had energies between 1 and 10 bev. The analysis of about 400 shower pictures shows no appreciable difference between the events observed at the two locations. Both show a variation of the primary mean free path from about 190 to 160 g/cm^2 over the energy interval covered. The statistics are not good enough to decide whether the mean free path of the secondaries also varies with the primary energy; a mean value of 250 g/cm^2 was observed. The ratio of the number of charged mesons to the number of protons increases with multiplicity from about 0.4 to 2.1, while the ratio of neutral to charged mesons is found to be 0.55 ± 0.1 for low multiplicities, and its lower limit for higher multiplicities is 0.36 ± 0.1. A distribution function was derived for the total shower multiplicities as a function of the primary energy. For low primary energies, small multiplicities are favored; but with increasing primary energy the distribution function becomes rather flat.

2686

MEAN FREE PATH OF NEUTRAL PENETRATING SHOWER-PRODUCING RADIATION. H. W. Boehmer and H. S. Bridge. Phys. Rev. 85, 863-7(1952) Mar. 1.

The collision mean free path has been measured in carbon and in lead for neutral cosmic particles capable of producing penetrating showers. Several types of events are selected with different multiplicities of particles in the penetrating shower. For the events with highest multiplicity the mean free path is 85 ± 12 g cm^{-2} in carbon, and 143 ± 30 g cm^{-2} in lead. (auth)

2687

THE LATERAL SPREAD OF COSMIC-RAY SHOWERS IN AIR AND LEAD. H. S. Green and H. Messel. Phys. Rev. 85, 679-80(1952) Feb. 15.

The lateral development of the nucleon cascade in air is investigated. Use is made of previous semiempirical derivations (by the authors) of differential cross sections for nuclear collisions at ultrarelativistic energies (Phys. Rev. 83, 842(1950)) and of the mean square angle of scatter in a nucleon-nucleus collision (Phys. Rev. 83, 1279(1951)). A plot is presented of the rms lateral spread of nucleons with energies greater than certain arbitrary values U. The mean square distance from the shower axis was found to be 162 $U^{-1}e^{-0.2\theta}$ $\{0.2\ \theta/1^2\cdot 1! + (0.2\ \theta)^2/2^2\cdot 2! + \cdots\}$ km^2, where θ is the depth measured in cascade units of 75 g/cm^2 and U is in proton mass units. The rms distance at sea level of a particle with energy > 10 bev from the axis of the shower is 2.1 km. Under a block of Pb 56 cm thick the rms distance for particles with E > 10 bev is 6.4 cm.

2688

DIURNAL VARIATIONS IN HIGH ENERGY COSMIC-RAY INTENSITIES. Paul H. Barrett and Y. Eisenberg. Phys. Rev. 85, 674-5(1952) Feb. 15.

Counter-telescope-coincidence experiments have been performed at a depth of 1600 m water equivalent to investigate the properties of high-energy cosmic rays. The particles observed appear to be μ mesons which were created with 10^{12} ev average energy by π mesons of 1.3×10^{12} ev energy. The graph of solar time variation shows that within two standard errors the rms value of a solar diurnal effect is < 1%. The existence of a sidereal diurnal effect > 2% seems improbable. The observed isotropy indicates that the galactic magnetic fields must have a strength of at least 10^{-9} gauss.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2689

Argonne National Lab.

THE CRYSTAL STRUCTURE OF NEPTUNIUM METAL, by W. H. Zachariasen. Argonne National Lab. and Univ. of Chicago. Jan. 22, 1952. Decl. Mar. 24, 1952. 11p. (AECD-3336; ANL-FWHZ-199)

Neptunium metal is found to be orthorhombic with eight atoms in the unit cell. The unit cell dimensions are $a_1 = 4.73 \pm 0.01$ A, $a_2 = 4.89 \pm 0.01$ A, $a_3 = 6.65 \pm 0.02$ A. The calculated density is $\rho = 20.46 \pm 0.15$ g/cc. The space group is Pmcn. The atomic positions are:

$$4 \text{ atoms Np(I) in } \pm(\tfrac{1}{4}, y_1, z_1)(\tfrac{1}{4}, \tfrac{1}{2} - y_1, z_1 + \tfrac{1}{2})$$

$$\text{with } y_1 \approx 0.174 \quad z_1 \approx 0.014$$

$$4 \text{ atoms Np(II) in } \pm(\tfrac{1}{4}, y_2, z_2)(\tfrac{1}{4}, \tfrac{1}{2} - y_2, z_2 + \tfrac{1}{2})$$

$$\text{with } y_2 \approx -0.174 \quad z_2 \approx 0.320$$

Each Np(I) atom has eleven neighbor atoms at an average distance of 2.98 A, and each Np(II) atom has thirteen neighbors at a mean distance of 3.16 A. The best value for the metallic radius of Np is 1.52 A, indicating the presence of about six valence electrons and one 5 f electron. (auth)

ELECTRICAL DISCHARGE

2690

SECONDARY ELECTRON EMISSION FROM METALS UNDER POSITIVE ION BOMBARDMENT IN HIGH EXTRACTIVE FIELDS. E. W. Webster, R. J. Van de Graaff, and J. G. Trump. J. Applied Phys. 23, 264-6(1952) Feb.

In the further study of breakdown mechanisms in high vacuum, experiments show that secondary electron emission from metals under positive hydrogen ion bombardment is small and increases only slowly with the electric field strength at the bombarded surface. Although more significant emission may yet be found with the heavier ions obtained in an actual vacuum gap, the particle interchange component of the breakdown process appears to be quantitatively inadequate on the basis of present measured electron and positive ion emission coefficients. The possible importance of negative-ion emission deserves consideration in the particle-exchange process. (auth)

GASES

2691

[Illinois Univ.]

DIFFUSION IN THE SYSTEM $C^{14}O_2$—CO_2 TO 1000 ATMOS-

PHERES PRESSURE, by K. D. Timmerhaus and H. G. Drickamer. [nd] 15p. (AECU-1940)

Diffusion coefficients D are presented for the system $C^{14}O_2$-CO_2 in the pressure range 100 to 1000 atm. at 0, 25, and 50°C. In the lower part of the range the results show little temperature coefficient for diffusion at constant density. At higher densities the temperature coefficient increases rapidly. The results are correlated in the form $D = D_0 \exp(-E/RT)$. D_0 and the activation energy (E) at constant density are given as a function of density in a form useful for extrapolation.

2692
RADIAL DISTRIBUTION FUNCTION OF A GAS OF HARD SPHERES AND THE SUPERPOSITION APPROXIMATION. B. R. A. Nijboer and L. Van Hove. Phys. Rev. 85, 777-83(1952) Mar. 1.

The term $g_2(r)$ proportional to the square of the density in the expansion of the radial distribution function g(r) of an imperfect gas in powers of the density is calculated exactly in the case of a gas consisting of hard spheres. The result is checked by means of Boltzmann's value of the 4th virial coefficient of such a gas. The integral equation for g(r), obtained on applying the superposition approximation introduced by Kirkwood and by Born and Green, can also be solved by an expansion in powers of the density. For the case of hard spheres the approximate $g_2'(r)$ found in this way is compared with the exact $g_2(r)$. As a further application of our result on $g_2(r)$ a certain integral is discussed, which is of interest in the treatment of interference effects in neutron scattering problems. (auth)

INSTRUMENTS

2693
Admiralty Centre for Scientific Information and Liaison, London (England)
BIBLIOGRAPHY OF PUBLISHED REFERENCES TO SERVOMECHANISMS AND ASSOCIATED DEVICES. H. L. R. Hinkley, comp. Nov. 1951. 58p. (ACSIL/Liby-8)

2694
RCA Labs. Div., Radio Corp. of America
QUARTERLY REPORT NO. 6; ELECTRONIC DEVICES FOR NUCLEAR PHYSICS (OCTOBER, 1951–JANUARY, 1952). Feb. 19, 1952. 18p. (AECU-1938)

Progress is reported on the development of a large-area photocathode multiplier; a high-gain, high-output multiplier; and a narrow-pulse-height photomultiplier. An investigation of the after-pulsing phenomena in photomultiplier seems to confirm the hypothesis that two separate mechanisms are involved. The first, which is very fast and has the appearance of delayed emission of electrons from the photocathode, has been found in all types of multipliers examined. The second, which involves a delay of 0.5 to 1 μsec and probably results from ion feedback, has been found only in two types of tubes, the 5819 and H-5037. This latter effect can be eliminated or at least considerably reduced by proper shielding and outgassing of the tube.

2695
NEPA Div., Fairchild Engine and Airplane Corp.
AN IMPULSE TYPE RESISTANCE WELDER, by E. R. Mann. Apr. 10, 1951. 8p. (NEPA-1799)

A semi-sinusoidal impulse welder, consisting basically of a means for discharging a condenser through the point of contact, is described, and the circuit is diagramed. The welder has been found useful and dependable for tacking small metal objects to suitable metal surfaces. Extremely high power densities of duration ~½ msec are provided at the welding surface.

2696
National Bureau of Standards
ELECTRICAL NOISE FROM INSTRUMENT CABLES SUBJECTED TO SHOCK AND VIBRATION, by Thomas A. Perls. Jan. 1952. 22p. (NBS-1388)

Existing information on the reduction of spurious signals from instrument cables is reviewed. A tentative theory is formulated to account for the known data. Subsequent experiments confirm this theory and allow the formulation of a detailed mechanism of noise generation in cables. The noise may be eliminated for practical purposes (reduced by a factor of 500 or more in some cases) by having continuous electrical conduction between both surfaces of the insulating dielectric and the adjacent conductors. A simple procedure is outlined to make short lengths of this cable for laboratory use and an industrially applicable method is suggested. There appears to be no limit on how small the diameter of such cables could be made. (auth)

2697
THE ATOMIC HEAT OF LEAD IN THE REGION OF ITS TRANSITION TO SUPERCONDUCTIVITY. J. R. Clement and E. H. Quinnell. Phys. Rev. 85, 502-3(1952) Feb. 1.

The carbon-resistor thermometers described by Brown, Zemansky, and Boorse in Phys. Rev. 84, 1050(1951) Dec. 1. (NSA 6-1280) have been used to make careful calorimetric measurements on Pb in the neighborhood of its normal temperature of transition to the superconducting state. The transition temperature was determined by measuring the thermometer resistance at which an abrupt change occurred in the self-inductance of a coil wound directly on the calorimetric sample. This data showed that the transition occurred in a temperature range of less than 0.002°. Experimental and theoretical values of the difference between the atomic heat in the superconducting state and in the normal state are tabulated. The reproducibility of the thermometers in the temperature region near 7°K was demonstrated.

ISOTOPES

2698
Los Alamos Scientific Lab.
AN ANOMALOUS TYPE OF He^3 FLOW, by E. F. Hammel and Adam F. Schuch. [nd] 6p. (AECU-1941; LADC-1146)

In the course of a study of the film flow of mixtures of He^3 and He^4, an anomalous type of He^3 flow in dilute solution was observed. Data are given for the behavior of a 3.9% He^3 solution at 1.57 and 1.92°K. This investigation has shown complete symmetry between the He^3 and He^4 flow properties below the λ-point of the solution. Specifically, He^3 exhibits the following transfer properties through fine capillaries, hitherto uniquely associated with liquid helium II: constant velocity of transfer independent of driving pressure, independence of length of path under certain conditions, similar temperature dependence of flow rate, and incapability of flowing into an evacuated space at an appreciable rate until its relative partial pressure is almost unity.

ISOTOPE SEPARATION

2699
UNSTEADY-STATE SEPARATION PERFORMANCE OF CASCADES. I. Elliott W. Montroll and Gordon F. Newell. J. Applied Phys. 23, 184-94(1952) Feb.

This paper concerns the exact solution of the nonlinear differential equations which describe the time dependent behavior of multistage cascade separating processes for separation of two very similar molecular species. The Rayleigh separation law is postulated for each stage. The main questions of interest in the nonstationary operation of cascades involve (a) their behavior while the concentration of the required component is being built up to the desired value; (b) the bahavior of the cascade during the transition from one stationary mode of operation to another; and (c) the manner in which local concentration fluctuations are propagated through the cascade. We have derived analytical expressions that are suitable for the discussion of all of these points in square cascades. The cases of finite, half infinite, and infinite cascades are considered with and without product withdrawal. A brief discussion of the linearization of a class of nonlinear second-order partial differential equations is given in an appendix. (auth)

2700

DISTRIBUTION OF COMPONENTS OF TERNARY ISOTOPIC MIXTURE ALONG CLUSIUS-DICKEL COLUMN. F. K. Elder, Jr., and R. E. McDonald. Phys. Rev. 85, 500-1(1952) Feb. 1.

An exploratory investigation has been made of the distribution of the components of a mixture of Ne^{20}(89.90%), Ne^{21} (0.28%), and Ne^{22}(9.82%) along a Clusius-Dickel hot-wire thermal-diffusion column during the approach to equilibrium. The details of construction of the glass Clusius-Dickel column are diagramed. The distribution curve shows that the distributions of Ne^{20} and Ne^{22} are effectively mirror images of each other. For these two isotopes there appears to exist in the column a pivot point, or point of constant concentration, at which the concentration never deviates from its initial value. The distribution of the Ne^{21} along the column at any instant is not a smooth monotomic curve as exhibited by the other two isotopes, but shows a definite hump in the lower half of the column. This hump is attributed to a partial differential separation of the Ne^{21} from the Ne^{22}, which is superimposed on the predominating separation of both the heavier isotopes from the Ne^{20}.

MASS SPECTROGRAPHY

2701

Radiation Lab., Univ. of Calif.

A TIME OF FLIGHT MASS SPECTROGRAPH (thesis), by William Ellis Glenn, Jr. Jan. 8, 1952. Decl. Mar. 6, 1952. 71p. (AECD-3337; UCRL-1628)

A mass spectrograph has been designed and constructed which measures e/m by measuring the time-of-flight of ions that have been accelerated and bunched by electrostatic fields. This instrument is similar to the Smyth and Wilson "Isotron." It has been able to collect about 20 percent of the ions formed of a given isotope. The resolution is such that the width of the intensity versus mass peaks is ¾ of a mass unit wide at 1 percent of the maximum intensity for all masses. The stability and linearity of the mass calibration is accurate to less than $1/10$ of a mass unit. Experimental determinations of the transmission, resolution, and calibration were made with rubidium, cesium, and thallium. Methods of detection include the use of an electron multiplier and vibrating reed electrometer. Methods of eliminating the direct, neutral beam and ions of the wrong transit time have been devised. The instrument can be used for the isolation of individual artificially produced radioactive isotopes and some preliminary experiments of this type have been performed. (auth)

2702

MASS NUMBERS OF THE 35-HR. KRYPTON AND OF THE 50-HR. ARSENIC ACTIVITIES. D. F. Bracher and A. R. Crathorn. Nature 169, 364(1952) Mar. 1.

Mass-spectrometric investigation of the 35-hr Kr activity produced by the Br(d,2n) reaction and the 50-hr As activity produced by the Ge(d,n) reaction have confirmed previous reports that these are due to Kr^{79} and As^{71}. The mass spectrometer used is described briefly.

2703

A LINEAR RADIO-FREQUENCY MASS SPECTROMETER. P. A. Redhead. Can. J. Phys. 30, 1-13(1952) Jan.

An r-f mass spectrometer is described which uses a system of electrodes similar to a linear accelerator to obtain velocity selection of tin ions. A beam of ions is directed through a series of axial r-f fields with alternate polarity, and the ion with a velicity (proportional to $M^{-1/2}$) such that it traverses the individual stages in approximately one-half period of the r-f field, acquires maximum energy from this field. A retarding field region prevents all ions, except the ion with maximum energy, from reaching the collector. An ion beam of large cross section is used. With 20 r-f stages a mass resolution of 1% is obtained. (auth)

2704

DIRECT DETERMINATION OF OXYGEN IN ORGANIC COMPOUNDS BY ELEMENTARY ISOTOPIC ANALYSIS. A. V. Grosse and A. D. Kirshenbaum. Anal. Chem. 24, 584-5 (1952) Mar.

Addition of O_2 enriched with O^{18}, high-temperature equilibration, and mass-spectrographic determination of the isotopic ratio gives the O content of organic substances with an average probable error of ±0.15%.

MATHEMATICS

2705

AN INTERATIVE METHOD FOR THE SOLUTION OF EIGENVALUE PROBLEMS. V. J. Berry and C. R. de Prima. J. Applied Phys. 23, 195-8(1952) Feb.

A simple iterative procedure is developed for the determination of eigenvalues and eigenfunctions associated with the solution of Sturm-Liouville problems in a finite interval. Both the frequency and the displacement for a given mode may be determined with an accuracy which is independent of the accuracy involved in the calculation of other modes. Convergence of the iteration process is rapid, and the successive approximations to a given eigenvalue are shown to form a monotone sequence. The method is particularly useful when the coefficients of the differential equation are not expressed in analytical form. (auth)

2706

CALCULATION OF PERTURBATIONS IN QUANTUM MECHANICS. Marcel Mayot. Compt. rend. 234, 920-1(1952) Feb. 25. (In French)

A method is presented for determining the characteristic polynomial of a matrix the elements of which are algebraic quantities to which numerical values can not be directly assigned. The calculations are carried out by recurrence. In most cases the matrix is symmetric or hermitian.

MEASURING INSTRUMENTS AND TECHNIQUES

2707

Brookhaven National Lab.

PARTICLE LOCALIZATION BY MEANS OF A SCINTILLATION DETECTOR, by Luke C. L. Yuan and H. L. Poss. Feb. 29, 1952. 10p. (BNL-1120)

An abstract of this report was indexed as report AECU-1066 and appears in Nuclear Science Abstracts as NSA 5-1308.

2708

Westinghouse Atomic Power Div.

AN ANTICOINCIDENCE GAMMA RAY SCINTILLATION SPECTROMETER, by Richard D. Albert. September 1951. Decl. Mar. 28, 1952. 29p. (AECD-3330; WAPD-42)

A new type of scintillation spectrometer is described. It is designed to suppress signals arising from incident photons that are not completely absorbed in the primary detecting NaI(Tl) crystal. When an undesired signal is detected by means of a cluster of NaI(Tl) crystals surrounding the primary crystal, it is removed through the discriminating action of an anticoincidence electronic gate. Under conditions of good discrimination, this type of arrangement offers the advantage of yielding the gamma-ray spectrum directly without any interpretation of results which might become laborious, particularly if the incident gamma radiation has a complex spectrum. Results are presented that illustrate the discrimination action of the device by means of photographic representations of the scintillation gamma-ray spectra of Cs^{137} and Na^{22}. (auth)

2709

Atomic Energy Research Establishment, Harwell, Berks (England)

A NEW BASE, SOCKET AND NEOPRENE PROTECTOR FOR G.M. COUNTER TUBES, by F. Wade. Oct. 18, 1951. (AERE EL/R-805)

By the choice of suitable materials a base and socket can be made that will have the properties of high insulation resistance between pins, i.e., not less than 10^9 ohms. The base may be fixed to a G-M counter by conventional or other means. By inserting the counter and base into a neoprene molding a hermetic seal is obtained between counter base and molding. The molding is designed so that when the counter is inserted into its socket another hermetic seal is made between molding and socket thereby giving full protection to the base pins and connectors. (auth)

2710

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

RADIOACTIVITY AND CYCLOTRON GROUP, SYNCHROTRON GROUP AND THEORETICAL GROUP, p.54-96 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 43p. (NP-3698 (p.54-96)

The absorption of Co γ rays in Ta has been found to vary greatly as a function of absorber position and thickness. In studies of the effect of negative ion formation on the operation of proportional counters, it has been found that the addition of up to 1.3% He in CH_4 does not change the tube performance from that of a pure CH_4 counter. Above this concentration of He (at a total pressure of ~2 atm.) the pulse heights are so small that no peaks can be determined with the differential discriminator. The characteristics and calibration of several specific measuring instruments are described. A summary is given of the results of the r-f measurement of the Zeeman effect of the ^3S state of positronium. Fairly detailed report is made of experiments using NaI as a detector of protons in cyclotron-induced reactions. The NaI counter is diagramed; graphs of pulse distribution and discriminator data are presented; and microphotometer traces of oscilloscope patterns are shown for protons on C, Mg, Au, Al, Na, and polystyrene and for deuterons on C. The angular distribution of inelastically scattered protons corresponding to the first excited level in C^{12} at 4.47 Mev is plotted. Graphs show the angular distribution and energy spectrum of protons from Fe^{56}(d,p). Brief statements are made about problems under consideration by the theoretical group.

2711

Atomic Energy Project, Univ. of Calif.

A NEW PLASTIC TAPE FILM BADGE HOLDER, by Arturo Frisoli and Louis B. Silverman. Issued Mar. 24, 1952. 11p. (UCLA-189)

A new film badge holder has been designed consisting of a plastic tape film holder envelope with built-in metal filters, and a metal closure for the envelope. The materials, specifications, methods of assembly, and illustrations for making the complete holder are given. Suggestions for loading the holder, identification marking of films with x rays, and adapting the holder for wrist or hand monitoring operations are included. (auth)

2712

Argonne National Lab.

PROPOSAL FOR A LENS TYPE PAIR SPECTROMETER, by Melvin S. Freedman. Mar. 1952. 4p. (AECU-1931; UAC-522)

A method is proposed for converting a lens spectrometer to use as a pair spectrometer without loss in the transmission or resolution realizable as an ordinary "singles" spectrometer. One needs only to use for the detector, in the normal axial position, a thick-crystal scintillation counter, and to select with a pulse analyzer, and count as pairs, only those pulses corresponding to twice the energy being focused by the magnetic field. As in the other lens-type pair spectrometers, the maximum measurable γ energy is twice the maximum focusable electron energy plus 1.02 Mev. Positrons stopped in the crystal give rise to annihilation radiations; one or both quanta may be counted in the crystal, increases the pulse height by up to 1.02 Mev. Electrons backscattered from the crystal expend only a fraction of their energy in the crystal. The much lower backscattering from anthracene (~15%) makes it a better choice than NaI-Tl for this purpose. The double-lens instrument has the advantage over the single lens of larger transmission, and trajectories diverging up to 30° from the axis can be focused. At low γ energies, where the angle between the negatron and positron (in the laboratory system) is large, this increases the effective transmission. The higher the resolution of the scintillation energy analyzer, the lower will be the background due to single positrons, and the closer to the limit of 2.04 Mev will the background be reduced.

2713

Westinghouse Atomic Power Div.

FEASIBILITY STUDY OF A NEUTRON FLUX BOLOMETER, by Robert R. Leonard. Sept. 5, 1951. Decl. Mar. 24, 1952. 37p. (AECD-3325; WAPD-5(Rev.))

A small low impedance flux monitoring device has been built which utilizes the heating (and consequent change in resistance) of a boron-coated Pt wire. Feasibility tests in a reactor indicate that it may develop into a wide-range instrument, particularly useful at high flux levels. Design and constructional details of the bolometer and its associated circuits are given. The circuitry is somewhat unique since it is, in effect, an all-electronic self-balancing bridge. Future lines of research are suggested to solve some of the remaining problems. Circuit diagrams and photographs of the instrument are included.

2714

DESIGN AND USE OF A COINCIDENCE CIRCUIT OF SHORT RESOLVING TIME. R. E. Bell, R. L. Graham, and H. E. Petch. Can. J. Phys. 30, 35-52(1952) Jan.

A coincidence circuit for use with anthracene or stilbene scintillation counters is described. Its resolving time lies in the 10^{-9}-sec range, in agreement with theoretical estimates of the minimum possible resolving time with these scintillation counters. Examples are given of the use of the circuit in the measurement of short γ-ray half-lives and, in conjunction with β-ray spectrometers, in the determination of the details of radioactive disintegration schemes. The new results given in these examples are as follows:

Gamma energy, kev	Emitted by	Parent activity	Half-life, sec	Radiation shown to precede γ-ray of first column
158	Hg^{199}	Au^{199}	$2.35 \pm 0.2 \times 10^{-9}$	297 ± 10 kev β
207	Hg^{199}	Au^{199}	$<2 \times 10^{-10}$	250 ± 15 kev β
80	Xe^{131}	I^{131}	$4.8 \pm 2.0 \times 10^{-10}$	284 kev γ
364	Xe^{131}	I^{131}	$<10^{-10}$	
637	Xe^{131}	I^{131}		335 ± 15 kev β
722	Xe^{131}	I^{131}		250 ± 15 kev β
411	Hg^{198}	Au^{198}	$<3 \times 10^{-11}$	
238 (F-line)	ThC(Bi^{212})	ThB(Pb^{212})	$<10^{-10}$	

2715

MEASUREMENT ON THE I, F, AND A LINES OF THORIUM BY A NEW METHOD. H. Craig. Phys. Rev. 85, 688(1952) Feb. 15.

A new method has been used to measure the specific momenta of the I, F, and A electron lines of ThC (Bi^{212}). The method consists in the recording on a photographic plate of the line image of a line source. The angular rotation of the image with respect to the object can be found by producing a second image on the plate with the lens current reversed. For comparative determinations of momentum, only the angle and the lens current are required. Specific momenta of the ThC F and I lines were measured as 1388.5 ± 0.3 and 1753.9 ± 0.4 gauss-cm, respectively. The $H\rho$ value of the A line, by ratio to the F line, has been found to be 533.66 ± 0.12 gauss cm.

2716

HIGH ENERGY INDUCED FLUORESCENCE IN ORGANIC LIQUID SOLUTIONS (ENERGY TRANSPORT IN LIQUIDS). III. Milton Furst and Hartmut Kallman. Phys. Rev. 85, 816-25 (1952) Mar. 1.

Experimental results on the fluorescence of a large number of efficient solutions under both gamma-ray and alpha-particle excitation are presented. These results are compared with the theory to be found in Part I, and very good agreement is obtained in almost all cases. The physical efficiencies of some of these solutions under gamma-ray excitation are found to be quite high when compared with an anthracene crystal. The light output for the same amount of absorbed energy is considerably less for alpha-particle excitation than for gamma-rays in all of the solutions. The experimental data are discussed in conjunction with the theoretical considerations, and the physical processes involved in the large fluorescence of the solutions are analyzed. (auth)

2717

REMARK ON THE STUDY OF THE PHENOMENON OF AXIAL FOCUSING IN MAGNETIC SPECTROGRAPHS WITH A PLANE OF SYMMETRY. Joesph Lafoucrière. Compt. rend. 234, 936-8(1952) Feb. 25. (In French)

By applying a new system of curvilinear coordinates, the author has corrected the equation of Svartholm and Seigbahn (Arkiv Mat. Astron. Fysik 33, No. 4, Paper 21(1947)) for the angle of axial focusing of particles emitted from the symmetry plane of a magnetic field and has developed a very general method of constructing focusing trajectories in magnetic spectrographs.

2718

ON PHOTOMETRY IN THICK NUCLEAR EMULSIONS. M. Ceccarelli and G. T. Zorn. Phil. Mag. (7) 43, 356-66 (1952) Mar.

Photometric methods of determining the ionization produced by a charged particle in passing through nuclear emulsions are discussed, and a technique based on measuring the mean width of a track is described. The method has been tested by applying it to a study of the heavy primary component of cosmic radiation. It is concluded that the photometry of tracks produced by charged particles passing through electron-sensitive emulsions may be used as a sensitive measure of the specific ionization for values of the rate of loss of energy less than 30 and greater than 200 Mev/g/cm². Similar methods can also be applied for identifying multiply charged particles, if they are arrested in the emulsions, and if the length of their tracks exceeds 200 μ. (auth)

2719

REMARK ON THE EFFICIENCY OF γ-RAY DETECTION BY SCINTILLATION COUNTERS. Henri Piatier. Compt. rend. 234, 939-41(1952) Feb. 25. (In French)

A formula for the ratio of the scattering cross section of γ radiation to the classical Thomson cross section is derived for the case where the Compton effect is solely responsible for the detection, as is generally true for organic fluorescent substances, such as anthracene, stilbene, tolane, etc. Values of this ratio are tabulated for γ-ray energies of 0.33 to 20 mc^2 and for energies of the scattered electron greater than 0.1, 0.2, 0.3, 0.4, and 0.5 mc^2.

2720

EFFICIENCY OF A SCINTILLATION COUNTER WITH ANTHRACENE PHOSPHOR FOR HIGH-ENERGY GAMMA-RAYS. Ole Lönsjö. Nature 169, 365-6(1952) Mar. 1.

The efficiencies of a 2-cm × 3-cm × 3-cm anthracene phosphor for 6.2-, 9.5-, and 17.5-Mev γ rays were found to be 6.0, 5.5, and 4.0%, respectively. Placing a 1-mm Pb sheet in front of the phosphor changed these to 3.5, 6.0, and 11.5%, respectively. The results are reliable to within 10%.

MESONS

2721

Radiation Lab., Univ. of Calif.

FAST MESON INTERACTIONS IN NUCLEAR EMULSIONS; PART II. ON π^+ MESONS, by Bayard Rankin and Hugh Bradner. Feb. 25, 1952. 20p. (UCRL-1692)

π^+ mesons produced in the exterior proton beam of the Berkeley cyclotron are bent by an auxiliary magnet and detected in Ilford G5 emulsions. Extra care is taken to eliminate protons from the data and a special technique is developed to make more efficient small angle scattering measurements. The average initial energy, 45.5 Mev, is slightly higher than that of the π^- mesons, and the spread in energy is greater. Less than 18 percent of the observed track is less than 30 Mev and 98 percent of it is over 22 Mev. No disappearances are found over the 902 cm of track. No inelastic scatters are found among the 5 scatters greater than 30°. Though the star frequency is the same as in the previous experiment, the frequency for scatters is significantly lower, a fact which is not explained by the slightly higher energy. A statistical upper bound on the cross section for π^+ scattering on hydrogen is obtained as 2.3×10^{-26} cm². (auth)

2722

THE EMISSION OF SLOW POSITIVE AND NEGATIVE MESONS FROM NUCLEAR DISRUPTIONS PRODUCED BY COSMIC RADIATION. Herman Yagoda. Phys. Rev. 85, 891-900(1952) Mar. 1.

Microscopic examination of 76 cc of thick (300 to 1800 microns) nuclear emulsion exposed in the stratosphere has revealed 168 events in which slow mesons are created and terminate their range in the recording medium. Basing the identification of the sign on either π-μ decay or σ-star formation at the range terminus, 26 of the ejected particles were

π^+ mesons and 145 π^-. The small value of the π^+/π^- ratio is attributed chiefly to the production of the ejected mesons by neutral radiation. The observational frequency of the ejected π^- mesons increases rapidly with star size and is approximately proportional to the square of the excitation energy of the parent star. In two events initiated by charged primaries several slow negative mesons were ejected as the wide-angle members of large showers of particles. In general, the energy of the slow mesons is between 0.3 and 40 Mev. Corrected for escape from the emulsion the average frequency of the π^- meson production is proportional to $E^{0.6}$ for $E \leq 8$ Mev and to $E^{2.3}$ for energies between 8 and 40 Mev. Comparison of the data on ejected mesons with that available on cyclotron mesons indicates close similarity in the form of the secondary star spectra, the π^+/π^- ratio and the energy distribution of slow π^- mesons. (auth)

2723

THE HYPOTHESIS OF CHARGE INDEPENDENCE FOR NUCLEAR PHENOMENA. Kenneth M. Watson. Phys. Rev. 85, 852-7(1952) Mar. 1.

The hypothesis of charge independence for nuclear phenomena is a symmetry condition which leads to nontrivial relationships to be satisfied by an extensive class of meson-nucleon interactions. Application of the principle to meson production by nucleon collisions and by photons and to meson scattering leads to a number of sensitive tests of the hypothesis. No contradictions are found from the present rather limited experimental data. Extension of the principle to heavy unstable particles (such as V particles) is discussed. (auth)

2724

TOTAL CROSS SECTIONS OF 60-MEV MESONS IN HYDROGEN AND DEUTERIUM. P. J. Isaacs, A. M. Sachs, and J. Steinberger. Phys. Rev. 85, 803-5(1952) Mar. 1.

The total cross sections of positive and negative mesons of average energy 58 Mev have been measured in hydrogen and deuterium. The results are $\sigma(\pi^+ + p) = 27.8 \pm 2.5$ mb; $\sigma(\pi^- + p) = 17.6 \pm 2.2$ mb; $\sigma(\pi^+ + d) = 38.3 \pm 3.1$ mb; $\sigma(\pi^- + d) = 32.8 \pm 3.1$ mb. The deuteron cross sections are related to the elementary scattering amplitudes in the impulse approximation, and the observed interference is compared to that predicted in weak-coupling meson theory. (auth)

2725

NONLINEARITIES RESULTING FROM VACUUM POLARIZATION IN MESON-NUCLEON INTERACTIONS. B. J. Malenka. Phys. Rev. 85, 686-7(1952) Feb. 15.

The meson-wave equation as modified by vacuum polarization is derived; the calculation takes account of the creation of virtual nucleon-antinucleon paris by a prescribed slowly varying pseudoscalar meson field. This vacuum-polarization calculation explains the Φ^4 divergence associated with the scattering of mesons by mesons.

2726

PHENOMENA ASSOCIATED WITH NEGATIVE μ-MESONS STOPPED IN PHOTOGRAPHIC EMULSIONS. W. F. Fry. Phys. Rev. 85, 676-7(1952) Feb. 15.

Electron-sensitive nuclear emulsions were exposed behind absorbers in the 145-Mev π^-- meson beam of the University of Chicago cyclotron. The additional range of ~1 in. in Cu of the μ mesons made it possible to separate the μ from the π mesons. The meson tracks and their endings are described. The percentage of captured μ^- which produced stars is 5.2 ± 1; the percentage of μ^- which decayed in the photographic emulsions is 39 ± 3. The ratio of the stopping power per atom of the gelatin, for low-energy mesons, is 4.8.

2727

PHOTOMESON PRODUCTION FROM DEUTERIUM. I. L. Lebow, B. T. Feild, D. H. Frisch, and L. S. Osborne. Phys. Rev. 85, 681-2(1952) Feb. 15.

A heavy-paraffin target was exposed to the 330-Mev bremsstrahlung spectrum from the NIT synchrotron. The energy distributions of $\pi^{\pm}$ mesons were measured by observations of the tracks in nuclear emulsions. The average π^-/π^+ yield ratio was found to be 0.5 ± 0.5 at 90° and 0.90 ± 0.23 at 26°. The graph of the ratio of total number of π^+ mesons from D and from H in the energy range 65 to 145 Mev at 26° and 40 to 105 Mev at 90° suggests that there is a large spin-dependent interaction.

2728

EVIDENCE FOR THE EXISTENCE OF NEUTRAL PARTICLES OF VERY SHORT LIFE-TIME. M. Danysz, W. O. Lock, and G. Yekutieli. Nature 169, 364-5(1952) Mar. 1.

Observations on correlation in direction and energy between pairs of π mesons emerging from energetic nuclear disintegrations, i.e., stars in nuclear emulsions exposed to cosmic radiation, suggest the existence of neutral particles, ξ^0, of mass 556 m_e and lifetime $< 10^{-14}$ sec which decay according to the scheme $\xi^0 \to \pi^+ + \pi^- + Q$, where Q is 2 to 5 Mev.

2729

SELF-ENERGIES OF NUCLEONS AND THE MASS SPECTRA OF HEAVY PARTICLES. H. Enatsu. Phys. Rev. 85, 483-4(1952) Feb. 1.

The author has previously (Progress Theoret. Phys. (Japan) 6, 434, 642(1951)) introduced heavy mesons (C′ mesons) of symmetrical scalar type with vector coupling. The mass of these mesons was assumed to be ~1470 m_e. It is now shown how these models can be modified to give a better fit with recent experimental cosmic-ray data by the assumption that V_1 particles are elementary particles obeying Dirrac's equation and that they interact with nucleons and C′ mesons. The models described may furnish an interpretation of part of the mass spectra of elementary particles.

2730

NUCLEAR CROSS SECTIONS FOR NEGATIVE PIONS OF ENERGY 109 AND 133 MEV. R. L. Martin, H. L. Anderson, and G. Yodh. Phys. Rev. 85, 486-7(1952) Feb. 1.

Total nuclear cross sections of C, Al, Cu, Cd, Sn, and Pb for negative pions of initial energy 122 or 145 Mev have been measured by a scintillation-counter coincidence arrangement. The observed cross sections agree with the geometrical absorption plus inelastic scattering cross sections within the 15% uncertainty of the technique. With the possible exception of C no energy dependence was demonstrated for the energy range 85 to 133 Mev.

MICROWAVES

2731

Atomic Energy Research Establishment, Harwell, Berks (England)

GROUP VELOCITY AND ENERGY VELOCITY IN PERIODIC WAVEGUIDES, by J. S. Bell. 1952. 5p. (AERE-T/R-858)

Two proofs are given that energy and group velocities are equal for an unattenuated electromagnetic wave in a periodic structure. The first is based on the examination of a modulated wave-train and the second is a direct demonstration from Maxwell's equations. (auth)

2732

[Atomic Energy Research Establishment, Harwell, Berks (England)]

A SEMICIRCULAR WAVEGUIDE LOADED BY A SEMICIRCULAR SLOTTED SHEET, by J. S. Bell and J. M. Bruce. [nd] 8p. (AERE T/M-57)

An approximate theory for the structure of a semicircular waveguide loaded by a semicircular slotted sheet is presented. When the dimensions are suitably chosen no wave other than the fundamental propagates in the frequency band of the latter. However, for a certain frequency band this fundamental wave can have either of two phase velocities for a given frequency, one of the phase velocities being associated with a negative group velocity. The frequency band referred to is in the region of the lowest waves and constitutes a difficulty in the use of the device for such waves. (auth)

2733

BEAM SYSTEM FOR REDUCTION OF DOPPLER BROADENING OF A MICROWAVE ABSORPTION LINE. H. R. Johnson and M. W. P. Strandberg. Phys. Rev. 85, 503-4 (1952) Feb. 1.

A description is given of a beam system for reduction of Doppler broadening of a microwave absorption line. A schematic cross-sectional diagram of the gas cell and a block diagram of the detection and frequency stabilization systems are shown. The absorption of a plane wave in passing perpendicularly through a beam of $N^{14}H_3$ molecules was investigated using the technique described; line half-widths of 20 kc at half-intensity were obtained.

MOLECULAR PROPERTIES

2734

MOLECULAR BEAM MAGNETIC RESONANCE SPECTRA OF $Rb^{87}F$ AND $Rb^{87}Cl$ AT ZERO FIELD. D. I. Bolef and H. J. Zeiger. Phys. Rev. 85, 799-802(1952) Mar. 1.

The radiofrequency spectra of $Rb^{87}F$ and $Rb^{87}Cl$ were investigated by the zero-field molecular-beam magnetic resonance method. The quadrupole line was found to be split into a series of component lines. The separations between the lines, as well as the shapes of the lines, are explained by taking into account the effects of (1) a cosine coupling of the form $c_a I\cdot J$ between the spin of Rb^{87}, I_a, and the rotational angular momentum of the molecule J; and (2) the dependence of the quadrupole interaction constant eqQ on vibrational quantum number v and rotational quantum number J of the form: $eqQ = e\bar{q}Q + eq^{(J)}QJ(J + 1) + eq^{(v)}Qv$. The results for Rb^{87} in $Rb^{87}F$ are: $|e\bar{q}Q|/h = 33.96 \pm 0.02$ Mc, $|eq^{(v)}Q|/h = 410 \pm 40$ kc, $|eq^{(J)}Q|/h = 26 \pm 4$ cycles/sec, $|c_a|/h = 1.1 \pm 0.1$ kc. $eq^{(v)}Q$ and $eq^{(J)}Q$ are shown to have signs opposite to that of $e\bar{q}Q$. The results for Rb^{87} in $Rb^{87}Cl$ are: $|e\bar{q}Q|/h = 25.37 \pm 0.04$ Mc, $|eq^{(v)}Q|/h = 230 \pm 50$ kc, $|eq^{(J)}Q|/h = 12 \pm 2$ cycles/sec, $|c_a|/h = 1.0 \pm 0.1$ kc. $eq^{(v)}Q$ and $eq^{(J)}Q$ are shown to have signs opposite to that of $e\bar{q}Q$. (auth)

2735

THE MOLECULAR BEAM ELECTRIC RESONANCE METHOD STUDY OF THALLIUM MONOCHLORIDE. R. O. Carlson, C. A. Lee, and B. P. Fabricand. Phys. Rev. 85, 784-7(1952) Mar. 1.

The hyperfine structure of the first rotational state of $TlCl^{35}$ and $TlCl^{37}$ was studied by the molecular-beam electric-resonance method. Two types of molecular transitions were observed: the conventional m_J transition in very weak and in strong Stark fields; the ΔJ transition ($J = 0 \to J = 1$), a molecular transition observed for the first time by molecular-beam methods in this experiment. Using the m_J-type transition, the electric quadrupole interactions involving the Cl nuclei were determined for the J = 1, v = 0 state. The values were $eqQ(TlCl^{35}) = -(15.795 \pm 0.004)$ Mc, $eqQ(TlCl^{37}) = -(12.446 \pm 0.003)$ Mc. The quadrupole interaction increased in absolute value by ½% from one vibrational state to the next higher one. The spin-rotation (I.J) interaction constants in TlCl were $+ 73 \pm 2$ kc for Tl, $+ 1.2 \pm 0.2$ kc for Cl^{35}, and $+ 1.0 \pm 0.2$ kc for Cl^{37}. From the rotational transition data and the strong Stark field m_J transition data, the following molecular constants were evaluated for $Tl^{205}Cl^{35}$: the rotational constant $B_e = 2620.1 \pm 2.5$ Mc; moment of inertia $A_e = 320.2 \pm 0.4 \times 10^{-40}$ g-cm^2, internuclear distance $r_e = 2.541 \pm 0.002$A, and dipole moment for the zeroth vibrational state $\mu_0 = 4.444 \pm 0.014$ Debye.

2736

MOLECULAR BEAM MAGNETIC RESONANCE SPECTRA OF $TlCl^{35}$ AND $TlCl^{37}$ AT ZERO FIELD. H. J. Zeiger and D. I. Bolef. Phys. Rev. 85, 788-98(1952) Mar. 1.

The molecular-beam magnetic-resonance method has be been used to investigate the spectra of $TlCl^{35}$ and $TlCl^{37}$ at zero field. A splitting of the quadrupole line for both isotopes is observed and is attributed to a cosine coupling of the form $c_a I.J$, between the Cl spin I_a and the rotational angular momentum of the molecule J. It is assumed that the gradient of the electric field at the position of the Cl nucleus q is a function of the internuclear distance R of the form

$$q(R) = q^{(0)} + q^{(1)}\,[(R - R_e)/R_e] + q^{(2)}\,[(R - R_e)/R_e]^2 + \dots$$

where R_e is the equilibrium value of R in the zeroth vibrational and rotational state (v = 0, J = 0). The average of q(R) over the vibration and rotation of the molecule is shown to lead to a v and J dependence of the quadrupole coupling eqQ of the form

$$eqQ = e\bar{q}Q + eq^{(J)}QJ(J + 1) + eq^{(v)}Qv.$$

The variation of eqQ with v and J explains the asymmetry observed in the TlCl line shapes. The energy levels and transition frequencies are calculated for TlCl. The zero-field lines for Na^{23} in $Na^{23}F$ and $Na^{23}Cl$ are also discussed and are analyzed using the same theory.

NEUTRONS

2737

Los Alamos Scientific Lab.

METHODS FOR MEASURING FAST NEUTRON CROSS SECTIONS, by H. H. Barschall. [nd] 45p. (AECU-1933; LADC-1135)

The measurement of neutron cross sections consists of a single transmission experiment in good geometry in which a sample is introduced between the source of neutrons and a detector. If I denotes the counting rate of the detector in the presence of the sample and I_0 the counting rate without the sample, the total cross section is given by $\sigma = (1/N)\ln(I_0/I)$, where N is the number of nuclei per cm^2 in the sample.

NUCLEAR PHYSICS

2738

ON THE RELATIVISTIC THEORY OF NUCLEAR FORCES. I. GENERAL THEORY. Maurice Levy. Compt. rend. 234, 815-17(1952) Feb. 18. (In French)

The author extends, in the system of two nucleon fields coupled by a neutral meson field, the nonadiabatic method of Tamm (J. Phys. U.S.S.R. 9, 449(1945)) and Dancoff (Phys. Rev. 78, 382(1950)) to any interaction between an arbitrary number of mesons and nucleons in intermediate virtual states. The states in which pairs of nucleons are present or in which the number of mesons is greater than one have negligible probabilities.

2739

ON THE RELATIVISTIC THEORY OF NUCLEAR FORCES. II. EQUIVALENCE WITH THE FORMALISM OF BETHE AND SALPETER. Maurice Levy. Comp. rend. 234, 922-4(1952) Feb. 25. (In French)

The formalism described in part I (cf. preceding abstract) is shown to lead to results identical with those derived from the covariant equation of Bethe and Salpeter (Phys. Rev. 82, 309(1951) 84, 350; 1232(1951)).

2740

FINE STRUCTURE SPLITTING IN THE GROUND STATE OF POSITRONIUM. T. A. Pond and R. H. Dicke. Phys. Rev. 85, 489-90(1952) Feb. 1.

The three-photon annihilation of positronium has been studied as a function of magnetic field strength. At six magnet currents, the coincidence rates in N_2 at 760 mm with and without 3% NO were compared. The percentage of positrons annihilating with three photons was found to decrease from 15.8% at 1.12 kgauss effective field to 11.8% of 6.32 kgauss.

2741

ELECTROMAGNETIC PROPERTIES OF SPIN-ONE PARTICLES. Daniel Leenov. Phys. Rev. 85, 841-9(1952) Mar. 1.

An analysis of the electromagnetic properties of a charged particle with spin 1 is made from two standpoints. Part I contains a phenomenological treatment, in which the methods of field theory are used to investigate scattering processes involving a particle with spin 1 and magnetic moment 1—γ magnetons, where γ is arbitrary. A calculation of the scattering cross section for unpolarized particles is obtained. Using this formula for the cross section, it is shown that studies of the multiple scattering of high-energy particles of this type will give a small but perhaps measurable indication of their spin and magnetic moment. Also, this theory shows that low-energy vector particles are not significantly depolarized when passing through matter, considering only electromagnetic effects. The μ-pair theory has been used by Wentzel (Phys. Rev. 79, 710(1950)) as a description of the π meson in order to predict certain of its properties. In Part II this theory has been generalized to the case of a vector particle made up of a spinor pair, and descriptions are given of the computation of the magnetic dipole moment and the electric quadrupole moment, as well as the cross sections for scattering and for dissociation because of interaction with a coulomb field, here including the case of a pseudoscalar π meson.

2742

THE COUPLING OF NUCLEAR SURFACE OSCILLATIONS TO THE MOTION OF INDIVIDUAL NUCLEONS. Aage Bohr. Kgl. Danske Videnskab. Selskab, Mat. fys. Medd. 26, No. 14(1952). 40p. (In English)

Various nuclear properties, such as quadrupole moments, are not explained satisfactorily by either the liquid-drop or single-particle models. In the present paper the nucleus is described in terms of a deformable surface coupled to the motion of individual nucleons. This model is referred to as the quasi-molecular model. For simplicity only the case of a single nucleon is considered. Classification of nuclear states and the adequacy of simple coupling schemes are discussed. In the limiting case of strong coupling the system is dynamically analogous to a linear molecule.

2743

A DEMONSTRATION EXPERIMENT ON POSITRON ANNIHILATION. J. S. Levinger. Am. J. Phys. 20, 71-2(1952) Feb.

A lecture demonstration on positron annihilation is discussed. By use of two small Geiger counters and a standard Rossi coincidence circuit, it can be demonstrated that the two annihilation photons go in opposite directions. A special arrangement of lead shielding is suggested. (auth)

NUCLEAR PROPERTIES

2744

Oak Ridge National Lab., Y-12 Area

THE NUCLEAR GYROMAGNETIC RATIO OF V^{50} AND MEASUREMENTS ON Rb^{85} AND Cl^{35}, by H. E. Walchli, W. E. Leyshon and F. M. Scheitlin. Jan. 29, 1952. 16p. (ORNL-1239)

The nuclear gyromagnetic ratio of V^{50} was determined in a nuclear induction spectrometer. An electronically regulated electromagnet maintained a field homogeneous to 0.1 gauss over the sample volume. Frequency measurements were made using a BC-221 frequency meter with an external 100-kc crystal-controlled oscillator and checked against radio station WWV (10 Mc). The sample consisted of 271 mg of vanadium as vanadium oxytrichloride ($VOCl_3$) of which about 10 percent was V^{50}. This was prepared from enriched vanadium pentoxide (V_2O_5) by a standard chemical vacuum technique. Measurements at three values of magnetic field gave the following ratio: $\nu(V^{50})/\nu(D) = +0.649527 \pm 0.00007$. The sign of the moment was determined to be positive by comparison with Rb^{85} and Cl^{35}. Using the value of 2.7926 nuclear magnetons for the proton moment and Levinthal's deuteron-to-proton ratio of 0.1535059, the nuclear gyromagnetic ratio for V^{50} becomes $+0.55690 \pm 0.00006$.

New frequency ratios for V^{50}/Rb^{85}, V^{50}/Cl^{35}, Rb^{85}/Cl^{35}, Rb^{85}/H^1, and Cl^{35}/H^1 are included and compared with previously reported values. (auth)

2745

THE ANGULAR CORRELATION OF TWO SUCCESSIVE NUCLEAR RADIATIONS. Stuart P. Lloyd. Phys. Rev. 85, 904-11(1952) Mar. 1.

A general formula is derived, using group-theoretic methods which gives the correlation as series in Jacobi polynomials whose argument depends on the angle between the radiations. The coefficients factor into quantities depending on the separate nuclear transitions, and the factors are worked out explicity for the directional correlation cases where one of the interfering radiation angular moments is the lowest or next-lowest allowed by conservation of angular momentum. Correction factors are given for converting lowest multipole $\gamma-\gamma$ correlations into an extensive class of directional correlations. (auth)

2746

THE SPIN AND QUADRUPOLE MOMENT OF Se^{79}. W. A. Hardy, G. Silvey, and C. H. Townes. Phys. Rev. 85, 494-5 (1952) Feb. 1.

The spin of Se^{79} has been determined as $7/2$ by observing the quadrupole pattern of the $J = 2 \rightarrow 3$ transition in $O^{16}C^{12}Se^{79}$. Six hyperfine components were identified by means of a high-sensitivity recording Stark spectrometer. The Se^{79} quadrupole moment is estimated as 1.2×10^{-24} cm^2, with an error < 50%. The Se^{79} state probably involves a $(g_{9/2})^3$ configuration in which two particles fail to pair off and give zero angular momentum, but give unit momentum instead.

2747

THE NUCLEAR MAGNETIC RESONANCE OF TITANIUM AND ARSENIC. C. D. Jeffries, H. Loeliger, and H. H. Staub. Phys. Rev. 85, 478-9(1952). (cf. NSA 6-1850).

By means of a recording radiofrequency spectrometer, nuclear magnetic resonance signals have been observed in liquid $TiCl_4$ and in an aqueous solution of H_2TiF_6. The signals are caused by either Ti^{47} or Ti^{49}, probably the latter. An $f_{7/2}$ state is indicated for the odd neutron, and the diamagnetically uncorrected value of the magnetic moment of Ti^{49}(or Ti^{47}) is -1.1022 ± 0.0003 nm. The nuclear magnetic resonance of As^{75} has been observed in an aqueous solution of Na_3AsS_4 and in a basic aqueous solution of Na_3AsO_4. The diamagnetically uncorrected value of the moment of As^{75} is $+1.4350 \pm 0.0003$ nm.

2748

THE NUCLEAR MAGNETIC MOMENT OF Tc^{99}. B. C. Frazer and R. Pepinsky. Phys. Rev. 85, 479(1952) Feb. 1.

A nuclear induction technique has been used to determine the magnetic moment of Tc^{99} to be $+ 5.6805 \pm 0.0004$ nm, assuming a diamagnetic correction of 0.411%. The Tc was in an aqueous solution of NH_4TcO_4, and all frequency-ratio measurements were relative to D in D_2O.

2749

A TWO-MODEL INTERPRETATION OF A NUCLEAR SPECTRUM. D. R. Inglis. Phys. Rev. 85, 492-3(1952) Feb. 1.

It is suggested that the structure of light nuclei may be approximated by a combination of the central model and the α model, one as an approximation to some states of the system and the other as an approximation to other states. For example, the first three states of Li^7 may be represented by the three low states of the α-model, and the fourth state at 7.4 Mev would be the ground state of the central model, a $^2P_{3/2}$. The interpretation of the ground state of any nucleus would depend on which model gives the lower energy; the α-model appears to represent the low states of nuclei in the region Li^6 to Be^9 and again at O^{16}, but in the neighborhood of C^{12} the low states of the central model are more stable.

2750

USE OF HD FOR EXPERIMENTS ON THE PROTON-DEUTERON MAGNETIC MOMENT RATIO. Norman F. Ramsey. Phys. Rev. 85, 688(1952) Feb. 15.

In experiments on the ratio of the proton magnetic moment to that of the deuteron, a dominant limitation to the accuracy has been the uncertainty as to the difference of the magnetic-shielding correction for molecules containing H and D. It is briefly pointed out that this uncertainty can be eliminated in future experiments by observing both the proton and the deuteron resonance in the molecule HD.

NUCLEAR TRANSFORMATION

2751

Los Alamos Scientific Lab.

(n,2n) CROSS SECTION OF Be^9, by Harold M. Agnew. Feb. 19, 1952. 7p. (LA-1371)

The average difference between the (n,2n) and absorption cross section in Be for various neutron spectra was measured using a sphere multiplication method. A value for this difference of 0.20 ± 0.04 barn was obtained for a RaBe neutron spectrum, 0.24 ± 0.07 barn for a Po-Be spectrum, and -0.16 ± 0.13 barn for a mock fission spectrum. (auth)

2752

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

NUCLEAR CHEMISTRY (ORGANIC) GROUP AND ONR GENERATOR GROUP, p.44-53 of PROGRESS REPORT; PERIOD NOVEMBER 30, 1951 TO FEBRUARY 29, 1952. Feb. 29, 1952. 10p. (NP-3698(p.44-53))

Performance of the ONR generator in its first operation with all the essential components installed is briefly discussed. It has been operated with a proton beam between 2 and 7.5 Mv. The $F^{19}(d,\alpha)O^{17}$ reaction has been investigated with 1.81-Mev deuterons and thin targets of BaF_2. The momentum spectrum of α particles at 90° to the incident beam is shown. Q values for the reaction and excitation energies for the ten O^{17} levels formed are tabulated. The final results of the investigation of the $Na^{23}(d,p)$ reaction are presented. Relative intensities of the twenty proton groups, Q values, and excitation levels in Na^{24} are tabulated.

2753

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

MEASUREMENTS OF NUCLEAR DISINTEGRATION ENERGIES OF LIGHT NUCLEI, by D. M. Van Patter. Jan. 15, 1952. 53p. (NP-3615; Technical Report No. 57; U20838)

A compilation was made of the measurements of ground-state reaction energies for nuclei with $Z \leq 20$ as reported in the literature up to November 1, 1951. The β and γ rays observed in the radioactive decay of nuclei in the same region of the periodic table are also listed. When several measurements of the same disintegration energy have been reported, a weighted average was taken. The nuclear reaction data were used to estimate the following mass differences: $n - H^1$, $n + H^1 - D^2$, $2H^1 - D^2$, $2D^2 - H^1 - T^3$, and $2D^2 - He^4$. It was then possible to calculate the reaction energies of many ground-state transitions for which no accurate measurements have been published. (auth)

2754

THE COLLISION MATRIX FOR THE COMPOUND NUCLEUS. T. D. Newton. Can. J. Phys. 30, 53-69(1952) Jan.

The nuclear collision matrix is calculated under the restrictions of the compound-nucleus hypothesis. The matrix so found contains only one undetermined function, $\tau(E)$, a phase shift caused by nuclear interaction. Cross sections are evaluated in terms of $\tau(E)$, a set of constants, and functions determined by the non-nuclear potentials. (auth)

2755

THE REACTION $Cl^{37}(p,n)A^{37}$; EXCITED STATES IN A^{38}. W. A. Schoenfeld, R. W. Duborg, W. M. Preston, and C. Goodman. Phys. Rev. 85, 873-6(1952) Mar. 1.

The relative neutron yield of the reaction $Cl^{37}(p,n)A^{37}$ has been observed from the threshold, at 1641 ± 2 kev, up to a proton energy of 2510 kev. Over 100 resonances are found; these correspond to excited states in the compound nucleus A^{38}, with an average separation of about 5 kev.

2756

THE YIELD OF GAMMA-RAYS AND NEUTRONS FROM THE PROTON BOMBARDMENT OF FLUORINE. H. B. Willard, J. K. Bair, J. D. Kington, T. M. Hahn, C. W. Snyder, and F. P. Green. Phys. Rev. 85, 849-51(1952) Mar. 1.

The excitation function of gamma rays produced by the proton bombardment of fluorine has been extended from 2.1 to 5.4 Mev with a resolution of 0.1 percent. 17 new resonances were observed with maxima at 2.32, 2.51, 2.63, 2.80, 3.02, 3.19, 3.49, 3.92, 4.00, 4.29, 4.49, 4.57, 4.71, 4.78, 4.99, 5.07, and 5.20 Mev. The $F^{19}(p,n)Ne^{19}$ threshold was determined to be 4.253 ± 0.005 Mev, and the neutron yield in the forward direction was extended to 5.3 Mev. Maxima occur at 4.29, 4.46, 4.49, 4.57, 4.62, 4.71, 4.78, 4.99, 5.07, and 5.20 Mev. The $Ne^{19} - F^{19}$ mass difference was calculated from the threshold measurement to be 0.00349_9 amu. (auth)

2757

REACTIONS INDUCED BY TRITONS IN PHOTOGRAPHIC EMULSIONS. Pierre Cüer and Denyse Magnac-Valette. Compt. rend. 234, 1049-51(1952) Mar. 3. (In French)

The reactions of tritons of ~3.8-Mev energy in Li-loaded nuclear emulsions were studied. The possible intermediates in the $Li^6(t,n)2\alpha$, $Li^7(t,2n)2\alpha$, and $N^{14}(t,pn)N^{15}$ are discussed, as well as the problems of the predominance of three-particle disintegration and neutron production.

2758

THE ANGULAR DISTRIBUTION OF NEUTRONS PRODUCED IN BERYLLIUM BY 170 MEV PROTONS. M. Snowden. Phil. Mag. (7) 43, 285-8(1952). Mar.

The angular distribution of high-energy neutrons produced by bombarding a Be target with the 170-Mev proton beam of the Harwell cyclotron has been measured. The angular spread for neutrons with energies greater than 50 Mev was found to be 67° at half intensity and in this spread the higher-energy neutrons were shown to be confined to the smaller angles. The total cross section for the production of neutrons with energies greater than 50 Mev was found to be $99 \pm 40 \times 10^{-27}$ cm_2, while the differential cross section at 4° was $69 \pm 30 \times 10^{-27}$ cm^2/steradian. (auth)

PARTICLE ACCELERATORS

2759

Oak Ridge National Lab.

THE PREPARATION OF THIN AND OF THICK TARGETS TO BE BOMBARDED BY POSITIVE PARTICLES, by Rene A. Bolomey. Issued Jan. 9, 1952. Decl. Mar. 24, 1952. 24p. (AECD-3331; ORNL-1163)

The target elements studied were Al, B^{10}, B^{11}, N^{15}, deuterium and tritium. The Al and B targets were made by evaporating the metals on various target mounts placed under a large bell jar which could be evacuated and maintained at a pressure of 2 to 4×10^{-6} mm Hg. Nitrogen, deuterium and tritium targets were made by absorbing the gases on Ta or Zr in a quartz and glass apparatus. Schematic diagrams of apparatus are included.

2760

A FIXED-FREQUENCY CYCLOTRON WITH 225-CM. POLE DIAMETER. Hugo Atterling and Gunnar Lindström. Nature 169, 432-4(1952) Mar. 15.

The new cyclotron constructed at the Nobel Institute for Physics, Stockholm, Sweden is described and illustrated. A deuteron beam of 25 Mev has been achieved. The cyclotron magnet has a total weight of 400 tons, the pole faces are 225 cm (88.5 in.) in diameter, the total gap is 350 mm, and the dee potential is 200 kv. The dee stems are insulated from the earth and connected to the outer conductors by means of condensers, which form a short circuit for the r-f current. With this arrangement it is possible to apply a d-c bias voltage to the dees to prevent discharges in the acceleration chamber.

RADIATION ABSORPTION AND SCATTERING

2761

Lewis Flight Propulsion Lab., NACA

ANALYTICAL METHOD FOR DETERMINING TRANSMISSION AND ABSORPTION OF TIME-DEPENDENT RADIATION THROUGH THICK ABSORBERS. II. SOURCE INTENSITY, TIME-DEPENDENT, by G. Allen. September 1949. 11p. (NACA-TN-1952)

See NSA 4-1817 for abstract.

2762

MULTIPLE COMPTON SCATTERING OF LOW ENERGY GAMMA-RADIATION. R. C. O'Rourke. Phys. Rev. 85, 881-8(1952) Mar. 1.

The approximate method of Chandrasekhar is used to solve several problems of multiple compton scattering of low-energy γ radiation. The solutions indicate an appreciable broadening of a primary monochromatic spectral distribution after it has passed through relatively small distances in the scattering medium. The results for the forward-scattering spectral distributions exhibit small shifts to the violet because of an approximation employed (viz., a Taylor series development). Chandrasekhar proposed that the area of this violet shift be used as a criterion of error; if this is accepted, the error is $<15\%$ at a distance of $x = 1$ and decreases rapidly with increasing x. The corresponding results for the backscattering spectral distributions exhibit negative intensities near the source, i.e., for small x. Again the area of this negative portion of the spectral distribution curves becomes negligible as x increases. The method seems to yield qualitatively correct results if only distances $x > 2$ are used. The backscattering spectral distribution was obtained in closed form for the case of a point source in an infinite spherical medium, and the results are plotted for two values of x.

2763

THE SCATTERING OF 0.5-MEV CIRCULARLY POLARIZED PHOTONS IN MAGNETIZED IRON. Forrest P. Clay and Frank L. Hereford. Phys. Rev. 85, 675-6(1952) Feb. 15.

The dependence of the intensity of compton-scattered circularly polarized (c.p.) radiation upon the initial direction of spin of the scattered electron has been investigated. C.p. photons of opposite senses were provided by the two-photon annihilation of positronium. Forward-direction compton electrons from two magnetized Fe foils were detected by two thin stilbene crystals. Scintillations were recorded by a fast coincidence circuit, and rates were measured for each of four configurations of the magnetic fields. The expected difference in coincidence rates fro the magnetic fields in the same and in opposite directions was 0.9%. The observed difference was 3.5 ± 0.8%.

2764

INTERACTIONS OF HIGH ENERGY NUCLEONS WITH NUCLEI. Part I. G. Bernardini, E. T. Booth, and S. J. Lindenbaum. Phys. Rev. 85, 826-34(1952) Mar. 1.

Goldberger (Phys. Rev. 74, 1269(1948)) attempted to explain the interaction of high-energy nucleons (~ 90 Mev) with heavy nuclei on the basis of a nucleonic cascade in a nucleon Fermi gas. The experimental test of this model was indecisive. In order to check the model at the higher energies available at the Nevis cyclotron, the interactions of 300 to 400-Mev protons and neutrons with the G-5 emulsion nuclei were analyzed. The experimental results are given and general evidence for the nucleonic cascade mechanism is presented. (auth)

2765

ON COLLISIONS BETWEEN ATOMS AND ELECTRONS. S. Kichenassamy. Compt. rend. 234, 1035-6(1952) Mar. 3. (In French)

Interactions between electrons and atoms are treated, as in the case of nuclear reactions, by assuming formation of a virtual complex in the sense of wave mechanics. Because of the relatively great distance between electrons, it is not possible to consider complete energy loss by the incident electron and simple distribution of this energy among all the constituents of the complex. The theory may permit explanation of the existence of negative ions and doubly excited atoms.

2766

RATIO OF THE K AND L PHOTOELECTRIC ABSORPTIONS OF γ RAYS. Nadine Marty. Compt. rend. 234, 938-9(1952) Feb. 25, (In French)

Experimental values of the ratio τ_L / τ_M of photoelectric absorption cross sections of the L and K levels of U, Pb, Au, and Ag have been determined with a magnetic spectrometer for the 411-kev γ rays of Au^{198} and the 140-kev γ rays of Tc^{99m}. These ratios have been compared with available calculations by the relativistic and nonrelativistic formulas of Hall (Revs. Modern Phys. 8, 358(1936)). Experimental results are in agreement with relativistic theory for Ag but are higher for the elements of high atomic number.

2767

THE COHERENT NEUTRON SCATTERING CROSS SECTION OF C^{13}. W. C. Koehler and E. O. Wollan. Phys. Rev. 85, 491-2(1952) Feb. 1.

A direct measurement of the scattering amplitude of C^{13} has been made by neutron-diffraction studies on one normal and two C^{13}-enriched samples of $BaCO_3$. The coherent scattering amplitude of C^{13} was determined to be $+0.60 \pm 0.04 \times 10^{-12}$ cm. The total scattering cross section of C^{13} was measured as 5.5 ± 1 barn by comparison of the transmission of neutrons by the normal and by the enriched $BaCO_3$ samples. Thus the isotopic incoherence because of the presence of C^{13} in normal C is not greater than ~1 mb, and the spin incoherence corresponds to a cross section of less than 0.03 barn.

2768

BUILD-UP FACTORS FOR TRANSMISSION OF Co^{60} GAMMA-RAYS THROUGH CONCRETE AND LEAD. W. R. Dixon. Phys. Rev. 85, 498-9(1952) Feb. 1.

Report is made of measurements of the transmission of a Co^{60} γ-ray beam of large area through thick barriers of concrete and Pb. The results are presented graphically in terms of a build-up factor, B, the quantity (1 + B) being determined from the ratio of the measured intensity to the intensity which would have been transmitted in narrow-beam or "good" geometry. The build-up factor for Pb is much lower than for concrete. The build-up curves show no tendency to flatten off.

2769

NOTE ON THE ANGULAR DISTRIBUTION OF RADIATION FROM FAIRLY THIN TARGETS BOMBARDED BY HIGH ENERGY ELECTRONS. J. D. Lawson. Phil. Mag. (7) 43, 306-8(1952) Mar.

Formulas are derived for the forward intensity and angular distribution of bremsstrahlung from targets sufficiently thin that ionization loss and straggling are negligible but sufficiently thick that multiple scattering of the electrons is important. Small-angle approximation is used, and a gaussian law for multiple scattering is assumed. Approximations used are compared with those applied by various authors who investigated the same problem but arrived at different expressions for the angular distribution.

RADIATION EFFECTS

2770

[Atomic Energy Research Establishment, Harwell, Berks (England)]

THE EFFECT OF PILE IRRADIATION ON THE EMANATING POWER OF ALUMINA, by J. N. Gregory and S. Moorbath. [nd] 4p. (AERE-C/M-129)

A sample of hydrated alumina was irradiated in the BEPO for a period of approximately two years. During this period the reactors power output was 34,546 Mwh. The investigation showed that prolonged irradiation had a small effect on the emanating power of α-Al_2O_3 at low temperatures. From the few results observed on the limited amount of irradiated sample it was impossible to determine the nature of the change producing the emanating power variation in the material and there is no certainty that the variation is a radiation-induced phenomenon.

2771

Westinghouse Atomic Power Div.

THE RESISTIVITY OF Cu_3Au DURING NEUTRON IRRADIATION, by H. L. Glick, F. C. Brooks, W. F. Witzig, and W. E. Johnson. Feb. 26, 1952. Decl. Mar. 28, 1952. 5p. (AECD-3332; WAPD-T-7)

Specimens of initially ordered and disordered copper-gold alloy (Cu_3Au) have been exposed to the neutron flux of a graphite-moderated nuclear reactor. The two specimens were irradiated at the same time and at the same position in the reactor. Their temperature was controlled at 80°C. Electrical resistivity measurements were made on the specimens during the course of the irradiation. The results are given as a function of the integrated thermal neutron flux (nvt), which was chosen as a convenient measure of the radiation dose. The measurements extend up to a total nvt = 6.5×10^{19} neutron/cm^2. The resistivity of the disordered specimen decreased continuously until nvt reached 4×10^{19} and remained essentially constant from then on at a value 7% below the initial value. The resistivity of the ordered specimen dropped rapidly at first, passing through a minimum 3% below the initial value at an integrated flux of 0.4×10^{19}. Thereafter the resistivity climbed linearly with the flux, reaching a value 23% above the initial value. The discontinuities in the ordered curve are caused by small decreases in the resistivity during reactor shutdowns. The possibility that mercury contributes to the disordering is being investigated.

2772

Westinghouse Atomic Power Div.

THE CONDUCTIVITY CHANGE IN POLYETHYLENE DURING γ-IRRADIATION, by S. Mayburg and W. L. Lawrence. Jan. 2, 1952. Decl. Mar. 25, 1952. 26p. (AECD-3326; WAPD-48)

The effect of Co^{60} γ irradiation on the d-c conductivity σ of polyethylene has been determined up to an intensity I of 4000 roentgen per hour at room temperature. The equation $\sigma/\sigma_{00} = 1 + (I/I_0)^{3/4}$ describes the data where σ_{00} is the conductivity without radiation and is the order of 10^{-18} (ohm cm)$^{-1}$ and I_0 is 20 roentgen/hr. Measurements at liquid nitrogen temperatures give a factor of 20 decrease in the normal conductivity and a factor of 25 decrease in the radiation induced conductivity below their respective room temperature values. These temperature data serve to suggest an ionic mechanism for electrical conduction in polyethylene as opposed to an electronic mechanism. In fact, the ion contributing most to the conduction in the polyethylene may well be the proton. (auth)

2773

Lewis Flight Propulsion Lab., NACA

ANALYTICAL METHOD FOR DETERMINING TRANSMISSION AND ABSORPTION OF TIME-DEPENDENT RADIATION THROUGH THICK ABSORBERS. III. ABSORBER WITH RADIOACTIVE DAUGHTER PRODUCTS, by G. Allen. June 1950. 17p. (NACA-TN-2108)

2774

CONSIDERATIONS REGARDING THE DISTRIBUTION OF RADIATION DAMAGE IN MATTER BOMBARDED BY LIGHT IONS AND A METHOD OF MAKING IT UNIFORM. Philip Schwed and Gerhart Groetzinger. J. Applied Phys. 23, 234-6(1952) Feb.

If a beam of high-energy particles impinges on a solid, radiation damage is produced only in a very thin layer at the end of the range of the particles. Computations determining the extent of this inhomogeneity of damage are outlined and carried out for the specific case of 20-Mev deuterons impinging on a copper sample. A simple method is discussed for producing uniform damage in a thickness corresponding to the range of the particles. (auth)

RADIOACTIVITY

2775

Radiation Lab., Univ. of Calif.

THE COMPLEX ALPHA SPECTRA OF AM^{241} AND Cm^{242}, by Frank Asaro, F. L. Reynolds, and I. Perlman. Feb. 16, 1952. 34p. (UCRL-1681)

The alpha particle spectra of Am^{241} and Cm^{242} was studied in detail utilizing a 75-cm radius-of-curvature, 60° symmetrical electromagnetic analyzer with photographic plate detection. The radioactive sources containing up to 3 μg/cm^2 of active atoms in the case of Am^{241} were prepared by vacuum sublimation. The average geometry of the spectrograph is about 4 parts in 10^5. The energy dispersion on the photographic plate is about 3.4 kev/mm for 5-Mev alpha particles and the width at half maximum of these alpha-particles group is about 7 kev. Six alpha-particle groups were found in Am^{241}, and their energies and abundances are 5.546 Mev, 0.23%; 5.535, 0.34%; 5.503, 0.21%; 5.476, 84.2%; 5.433, 13.6%; 5.379, 1.42%. In Cm^{242} two alpha-particle groups were found whose energies and abundances are 6.110 Mev, 73%, and 6.064, 27%. The alpha decay scheme is correlated with gamma rays and conversion electrons observed in this laboratory for both Am^{241} and Cm^{242}. The various alpha groups are evaluated with respect to the alpha-decay systematics, and the degrees of hindrance of the various alpha transitions are discussed with reference to normal trends in even-even nuclei. It is suggested that the totally different patterns of the spectra of the two nuclides are conditioned by the nuclear types. (auth)

2776

Carnegie Inst. of Tech.

ALPHA-GAMMA COINCIDENCES AND ANGULAR CORRELATION IN Po^{210}, by George H. Minton. Feb. 20, 1952. 50p. (NYO-3298)

Coincidence techniques have been used to study the fine structure of the α spectrum of Po^{210}. The low-energy (4.5 Mev) α particles were detected by a solution of terphenyl in phenylcyclohexane, and the γ rays by stilbene. The coincidence circuit, detector arrangements, and pulse-height curves are diagramed and described fully. It is concluded that the half life of the intermediate state is probably $<6 \times 10^{-10}$ sec. After the detection of the α particles in coincidence with the γ rays, a study was made of the angular correlation between the α particles and the succeeding γ rays. The results agree quite well with the distribution $P_2^1(\theta) = \sin^2 2\theta$ which is predicted by the theory for a 0-2-0-transition in which the α particle and the γ ray each carry two units of angular momentum and have even parity. It appears likely that the ground states of Po^{210} and Pb^{206} have spin zero and that the γ radiation is electric quadrupole. Theoretical angular correlation functions and considerations of detector geometry and efficiency are discussed.

2777

Carnegie Inst. of Tech.

INTERNAL CONVERSION IN I^{131}, by David Rose. Dec. 15, 1951. 85p. (AECU-1935)

A large double-focusing β-ray spectrometer was used to determine the internal conversion coefficients for the 284, 364, 638 and 724 kev γ rays from the decay of I^{131} to Xe^{131}. The 284, 364 kev transitions were studied to determine the operation of the spectrometer. The results from these appear to be in good agreement with the theoretical values. The 638 kev transition appears to be an electric dipole transition, from the comparison of α_k values, and hence this level will have odd parity and spin of 5/2, 3/2, or 1/2. The spins 3/2 and 1/2 seem unlikely since no transition from this level to the 80 kev level has been observed. The 724 kev transition appears to be a mixture of electric quadrupole and magnetic dipole, and the level must have even parity. For the spin values 3/2 or 1/2 the transition to the 80 kev level would be the same order multipole and of the same order of intensity as the direct transition to the ground state, it was not observed but the suggestion was made that it might be worth further investigation. An energy level diagram for the possible decay schemes is also given.

2778

Brookhaven National Lab.

DECAY OF Sr^{85} AND Sr^{85m}, by A. W. Sunyar, J. W. Mihelich, G. Scharff-Goldhaber, M. Goldhaber, N. S. Wall, and M. Deutsch. Brookhaven National Lab. and Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech. [nd] 21p. (BNL-1121)

Sr^{85} (65 d) decays by K-capture to an excited state of Rb^{85} of 513 kev-energy. This state is found to have a half life of 0.9 ± 0.2 μsec. It decays to the ground state of Rb^{85} by an M2 transition, identified by its internal conversion coefficient. Sr^{85m} (70 min) decays in three ways: 14% by K capture to an excited state of Rb^{85} of 150 kev, 84.7% by an E3 transition of 7.5 ± 1 kev followed by an M1 transition of 225 kev, 1.3% by an M4 crossover transition of 232.5 kev. A decay scheme for Sr^{85}, Rb^{85} and Sr^{85m} consistent with shell theory and isomer systematics is given. The existence of large ft values for allowed β transitions near closed shells is interpreted as due to a rearrangement of nucleons in the even-even core of an odd A nucleus. (auth)

2779

Carnegie Inst. of Tech.

DOUBLE BETA-DECAY, by Rolf G. Winter. Sept. 1, 1951. 70p. (NYO-913)

A term is added to the Fermi beta-decay hamiltonian which makes possible the emission of two electrons (without the emission of neutrinos) as a first-order process. Transition probabilities and selection rules for this process are obtained. To conduct an experimental search for double beta decay, a cloud chamber was designed and constructed. Pd^{108} and Pd^{110} being suspected of double beta decay with about 2.5-Mev available kinetic energy, natural palladium was installed in the chamber, and 10,097 acceptable pictures were taken. One of these photographs contains an event which looks like a double beta decay. However, this event may just as easily have been produced by cosmic gamma rays. Therefore one can only conclude that the half life of Pd^{108} is equal to or greater than 1.1×10^{18} years, and that the half life of Pd^{110} is equal to or greater than 0.6×10^{18} years. (auth)

2780

INVESTIGATION OF Ra(B + C) RADIATION WITH THE TROCHOIDAL METHOD. Peter M. Weinzierl. Acta Phys. Aust. 5, 185-8(1951) Dec. (In German)

The author has examined the radiations of Ra(B + C) (Pb^{214} + Bi^{214}) with a trochoidal magnetic spectrograph (Thibaud, Compt. rend. 197, 447(1933)). The results are in agreement with Thibaud's proposal (Compt. rend. 223, 984 (1946); 224, 739, 914(1947); 225, 934, 999, 1302(1947)) that a very light charged particle, the electrino, is a constituent of the radiation.

2781

A SEARCH FOR DOUBLE BETA-DECAY IN PALLADIUM. Rolf G. Winter. Phys. Rev. 85, 687(1952) Feb. 15.

Lower limits of 1.1×10^{18} and 0.6×10^{18} yr have been established for the half lives of Pd^{108} and Pd^{110}, respectively. 248.5 g of natural Pd were installed in a Wilson cloud chamber, and 10,097 acceptable photographs were taken. Only one photograph showed the tracks of two electrons emerging from the same point in the Pd. The event may represent double β decay or may be due to the ejection of two electrons by a γ ray passing through the foil.

2782

THE BEAT-SPECTRUM OF RaD. G. M. Insch, J. G. Balfour and S. C. Curran. Phys. Rev. 85, 805-7(1952) Mar. 1.

The electronic radiations from a very thin source of RaD are analyzed by means of a proportional counter, operating as a 2π spectrometer. The β rays of the continuum which coincide with the photoelectrons of highest energy form the tail on the pulse distribution which is analyzed to isolate the β particles and to compare their spectrum with Fermi theory The disintegration energy is found to be 64.5 ± 2.5 kev and the limiting energy of the β rays = 18 ± 2.5 kev. The form of the spectrum agrees with the theoretical shape for an allowed transition and $E_0 = 18$ kev. The presence of a complex system of soft photoelectron peaks, probably emitted mostly in casca is deduced from the remarkable shape of the pulse spectrum at low energies (5 to 25 kev). (auth)

2783

DECAY OF Te^{125m}. J. C. Bowe and P. Axel. Phys. Rev. 85, 858-62(1952) Mar. 1.

The two-step isomeric transition in Te^{125m} has been studie with proportional counters in coincidence, a NaI crystal scint lation spectrometer and a thin-lens beta-ray spectrometer. The following branching fractions were determined: 110-kev transition: K conversion = 0.54 ± 0.01, other conversion = 0.46, unconverted gamma ray = 0.0034 ± 0.0005; 35.5-kev transition: K conversion = 0.80 ± 0.05, L conversion = 0.11 ± 0.02, M conversion = 0.02 ± 0.004, unconverted gamma ray = 0.07 ± 0.02. These data are shown to confirm completely the level assignments in Te^{125} as $s_{1/2}$, $d_{3/2}$, and $h_{11/2}$. In addition, comparison with theoretical conversion coefficients show an agreement between experiment and extrapolated theoretical values. The second transition (35.5 kev) is almost entirely magnetic dipole; an upper limit of about 1 percent can be placed on the electric quadrupole admixture. (auth)

2784

ANGULAR CORRELATION OF ELECTRONS IN DOUBLE BETA-DECAY. H. Primakoff. Phys. Rev. 85, 888-90(1952) Mar. 1.

Angular correlation functions for the emitted electrons with corresponding electron energy spectra are obtained, assuming the Majorana theory of the neutrino, for allowed and first-forbidden nuclear double beta transitions. The associated decay mean lives are estimated $\approx 10^{12}$ yr, and $\approx 10^{16}$ yr, respectively, for $Z \approx 50$, and an atomic mass difference ≈ 1.5 Mev. A brief discussion is given of the reported experimental observations of double beta decay in the light of the deduced angular correlation functions, electron energy spectra, decay mean lives, and selection rules; the improbability of actual occurrence of the allowed 10^{12}-yr transitions is pointed out. (auth)

2785

STUDY OF THE RADIATION OF POLONIUM SOURCES WITH PHOTOGRAPHIC PLATES. Marie Ader, Jean Debiesse, and Théo Kahan. Compt. rend. 234, 827-8(1952) Feb. 18. (In French)

The relatively abundant long-range particles emitted by a Po source are shown to be knock-on protons, i.e., protons accelerated by impact of the Po α particles.

2786

INTERNAL-CONVERSION RADIATION OF U^{238}. Georgette Albouy and Jean Teillac. Compt. rend. 234, 829-30(1952) Feb. 18. (In French)

Electrons associated with α emission were observed in Ilford G5 emulsion impregnated with U. Energy distribution suggests that these result from internal conversion of a 50-kev γ ray. At least 24% of the U^{238} α decays are followed by conversion electrons. These results are in accord with those of Zajac (Phil. Mag. (7) 43, 264(1952)).

2787

INVESTIGATION OF THE 350-KEV γ TRANSITION ACCOMPANYING THE α EMISSION OF $AcC \rightarrow AcC''$. Jean Teillac, Paul Falk-Vairant, and Charles Victor. Compt. rend. 234, 1051-2(1952) Mar. 3. (In French)

Coincidences between the α particles and conversion electrons emitted in the AcC (Bi^{211}) $\rightarrow$ AcC″ (Tl^{207}) transition were studied with Geiger and proportional counters. The number of conversion electrons per disintegration was 0.030 ± 0.003, and the total internal-conversion coefficient was 0.21 ± 0.02. It is concluded that the γ radiation is a mixture of M1 and E2 radiation. The spin of the ground state of AcC″ is probably ½ and that of the 350-kev excited state probably 3/2.

2788

PREPARATION OF Ra^{229} AND Ac^{229}. F. Depocas and B. G. Harvey. Phys. Rev. 85, 499-500(1952) Feb. 1.

The β-disintegration energies of Ra^{229} and Ac^{229} were calculated by the method of decay cycles to be 2 Mev and 0.9 Mev, respectively, leading to predicted half lives of ~1 min. and ~1 hr. Ra^{228} was then irradiated in the NRX pile and the Ac was extracted by a rapid chemical separation. Periods of 66 ± 5 min and ~6.1 hr, attributed to Ac^{229} and Ac^{228}, respectively, were observed. The uncorrected (n,γ) cross section of Ra^{228} was calculated as 33 and 39 barns in two irradiations.

2789

THE DISTRIBUTION OF RADIOACTIVITY. R. I. B. Cooper. Nature 169, 350-2(1952) Mar. 1.

A discussion by C. F. Davidson, F. A. Paneth, E. C. Bullard, and others, held Oct. 26, 1951, on recent advances in knowledge of the distribution of radioactivity in terrestrial rocks and meteorites is reported. Related problems of variations in heat flow through the earth's crust, age determinations, survey methods, and U reserves also were discussed.

2790

BETA-SPECTRA OF CERIUM 144 AND PRASEODYMIUM 144. Cheng Lin-Sheng, G. John, and J. D. Kurbatov. Phys. Rev. 85, 487-9(1952) Feb. 1.

The β spectra of Ce^{144} and Pr^{144} in equilibrium have been investigated with a solenoidal spectrometer equipped with a G-M tube having a 0.57 mg/cm^2 rubber hydrochloride window. The low-energy part of the electron spectrum shows peaks for the conversion lines of γ rays of 54.7 ± 0.5, 79.4 ± 0.8, 134 ± 1, and 231 ± 2 kev. A Fermi plot of the total spectrum is shown and discussed. Beta spectra with the following upper energies are resolved: 3.00 ± 0.06 Mev, 1.30 ± 0.02 Mev, 605 ± 8 kev, 446 ± 8 kev, and 307 ± 6 kev.

2791

THE LOW ENERGY BETA-RAY SPECTRUM OF ^{170}Tm. R. Richmond and H. Rose. Phil. Mag. (7) 43, 367-71(1952) Mar.

A thin magnetic lens β-ray spectrometer in conjunction with a coincidence circuit employing a pair of photomultipliers has been used to examine the low-energy β-ray spectrum of Tm^{170}, which was expected to exhibit a forbidden shape. The spectrum was, however, found to have an allowed shape. The results may best be interpreted on the assumption that the transition is first forbidden with axial vector or tensor interaction, the latter interaction being slightly favored. (auth)

2792

THE α-HALF-LIFE OF Am^{241}. B. G. Harvey. Phys. Rev. 85, 482(1952) Feb. 1.

The specific α activity of a purified sample of AmO_2 has been determined with a low-solid-angle methane-filled proportional α counter, yielding a value of 470^{+5}_{-10} yr for the α half life of Am^{241}.

SHIELDING

2793

Oak Ridge National Lab.

TRANSFORMATION FROM DISC TO POINT SOURCE GEOMETRY, by E. P. Blizard. Mar. 27, 1952. 3p. (CF-52-3-219)

SPECTROSCOPY

2794

HYPERFINE STRUCTURE IN THE SPECTRUM OF ERBIUM. Kiyoshi Murakawa and Shigeki Suwa. Phys. Rev. 85, 683-4(1952) Feb. 15.

The hyperfine structure of the Er spectrum has been examined by means of a water-cooled hollow-cathode discharge tube and a Fabry-Perot etalon. More than twenty lines were found to possess an isotope shift, and the shifts in some typical lines are tabulated. The weighted mean of the isotope-shift ratios gives (170-168):(168-166):(166-164) = 1 : 0.92 ± 0.05 : 0.88 ± 0.07.

THEORETICAL PHYSICS

2795

AN ANALYSIS OF THE SELF-ENERGY PROBLEM FOR THE ELECTRON IN QUANTUM ELECTRODYNAMICS. P. N. Daykin. Can. J. Phys. 30, 70-8(1952) Jan.

Feynman's S-matrix for the self-energy of the free resting electron is evaluated without the restriction that the virtual photons in the intermediate state have only positive energy. Both the one-electron theory and the hole theory of the positron are treated. It is shown that in the one-electron theory the normally quadratically divergent transverse part of the self-energy vanishes if the photon field is assumed to be symmetric in positive and negative energies. A similar theorem does not hold in the hole theory. A particular type of interaction leads to a vanishing self-energy in one-electron theory. However, this does not solve the self-energy problem, as in this case radiation corrections to scattering would vanish as well. The S-matrix for the self-energy of a bound electron is evaluated in a similar manner. The decay probability for an excited state is calculated as the imaginary part of the self-energy. The correct value is obtained only in hole theory and in interaction with positive energy photons. In the special case in which the external field is a uniform magnetic field, again only hole theory with this same interaction gives the correct value for the anomalous magnetic moment. (auth)

2796

THE RELATIVISTIC DYNAMICS OF A SYSTEM OF PARTICLES INTERACTING AT A DISTANCE. L. H. Thomas. Phys. Rev. 85, 868-72(1952) Mar. 1.

The dynamics of a system of particles acting on one another at a distance can be relativistically invariant if the assumption of invariant world-lines is given up. This is shown by constructing a particular dynamics in which invariance over the homogeneous Lorentz group is trivial, but space as well as time displacement requires the solution of equations of motion or of a Schroedinger equation. This particular dynamics reduces in the nonrelativistic limit to the most general dynamics of a system of interacting particles admitting the Newtonian group. (auth)

2797

ANGULAR MOMENTUM IN NONLOCAL FIELD THEORY. D. R. Yennie. Phys. Rev. 85, 877-80(1952) Mar. 1. (cf. NSA 5-1700).

The decomposition of arbitrary nonlocal fields into irreducible parts is discussed. It is shown that the spin of a nonlocal particle is made up of two parts arising, respectively, from the transformation properties and from the nonlocal nature of the field; the two parts combine vectorially to give the total spin. (auth)

2798

COMMENT ON THE "IMPULSE APPROXIMATION." J. Ashkin and G. C. Wick. Phys. Rev. 85, 686(1952) Feb. 15.

A procedure is presented by which the expansion in powers of U′ mentioned just above Eq. 33 of the paper "Impulse Approximation" by Chew and Wick (Phys. Rev. 85, 636(1952); NSA 6-1544) can be achieved. The formulas developed also allow one to clarify the connection with the time-symmetrical treatment.

URANIUM AND URANIUM COMPOUNDS

2799

Los Alamos Scientific Lab.

LOW TEMPERATURE THERMAL EXPANSION OF URANIUM, by Adam F. Schuch and Henry L. Laquer. [nd] Decl. Mar. 26, 1952. 4p. (AECD-3324; LADC-1124)

A dial gage dilatometer has been used to measure the low-temperature thermal expansion of U rods which had been annealed for 6 hr in the β phase and then cooled slowly to room temperature. The U was found to expand upon cooling from the temperature of liquid N to that of liquid H. This behavior is reversible and there appears to be no hysteresis. The inversion of thermal expansion apparently corresponds to a density maximum.

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For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

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NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This list in the individual issues of Volume 6 supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 5, No. 24. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA.

Abbreviations used below are:

NSA - NUCLEAR SCIENCE ABSTRACTS
ADD - ABSTRACTS OF DECLASSIFIED DOCUMENTS the predecessor of NSA
NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948
AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)
AECU - To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-871, this code is applied only to reports carrying no other recognized code designation.)

Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability
AECD-2942	NSA 4-6362	$0.25
3273	6-76	Anal. Chem. 24, 423(1952); $0.10
AECU-1227	5-3326	J. Lab. Clin. Med. 39, 260-6(1952)
1251	5-3374	J. Am. Chem. Soc. 74, 1375-7(1952)
1359	5-4727	J. Chem. Phys. 20, 459-62(1952)
1380	5-4382	Anal. Chem. 24, 356-60(1952)
1712	6-252	J. Applied Phys. 23, 181-3(1952)
1729	6-679	Phys. Rev. 85, 483(1952)
1751	6-572	J. Am. Chem. Soc. 74, 1592-3(1952)
1896	6-2249	NSA
1897	6-2245	NSA
1898	6-2250	NSA
1899	6-2427	NSA
1900	6-2283	NSA
1903	6-2526	NSA
BMI-705	6-273	$0.15
BNL-1000	6-103	Nucleonics 10, No. 2, 33-5(1952)
1008	5-7331	J. Chem. Phys. 20, 349-51(1952)
1013	6-165	J. Biol. Chem. 194, 871-5(1952)
1092	6-2522	Phys. Rev. 85, 690-1(1952)
CUD-27	3-1742	Phys. Rev. 76, 693-5(1949)
28	3-1743	Phys. Rev. 76, 696-7(1949)
29	3-1744	Phys. Rev. 76, 692-3(1949)
30	3-1745	Phys. Rev. 76, 695-6(1949)
31	3-1746	Phys. Rev. 76, 697-8(1949)
32	3-1747	Phys. Rev. 76, 698-9(1949)
33	3-1748	Phys. Rev. 76, 689(1949)
35	3-2293	Rev. Sci. Instruments 20, 942-4(1949)
48	4-6682	Phys. Rev. 78, 812(1950)
49	4-6683	Phys. Rev. 78, 812-13(1950)
CUD-50	NSA 4-5253	Phys. Rev. 79, 178(1950)
91	5-5069	$0.10
ISC-149	6-1171	$0.15
156	5-5557	J. Am. Chem. Soc. 74, 1535-8(1952)
NP-3498	6-88	J. Am. Chem. Soc. 74, 1539-40(1952)
NYO-713	6-2528	Phys. Rev. 85, 144-5(1952)
736	5-6654	J. Am. Chem. Soc. 74, 1383-5(1952)
737	5-6652	J. Am. Chem. Soc. 74, 1385-7(1952)
915	6-1910	Phys. Rev. 85, 377-8(1952)
955	6-1509	Phys. Rev. 85, 697(1952)
3028	6-1546	Phys. Rev. 85, 497-8(1952)
3031	6-925	Phys. Rev. 85, 900-3(1952)
3032	6-408	Phys. Rev. 85, 698-9(1952)
3040	6-1547	Phys. Rev. 85, 695-7(1952)
ORNL-839	5-3363	Anal. Chem. 24, 548-50(1952)
1117	6-2327	J. Am. Chem. Soc. 74, 1282-6(1952)
ORO-49	5-6824	$0.10
TID-5059	6-491	$0.25
UCRL-1014 (4th rev. ed.)	5-4146	$0.95
1138	5-5095	Anal. Chem. 24, 463-4(1952)
1330	5-4364	Proc. Soc. Exptl. Biol. Med. 78, 200-2 (1951)
1429	6-152	J. Chem. Phys. 20, 459-62(1952)
1483	6-153	J. Chem. Phys. 20, 339(1952)
1618	6-1538	Phys. Rev. 85, 689(1952)
UR-170	5-5134	Anal. Chem. 24, 539-42(1952)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 1, page "SUPPLEMENT 1".

${}_{3}\mathrm{Li}_{4}^{7}$	$\dfrac{\sigma[B^{10}(n,\alpha)Li^{7}]}{\sigma[B^{10}(n,\alpha)0.477\text{ level }Li^{7}]}$ graph for $E_n = 0 - 4$	H. Bichsel et al., Helv. Phys. Acta 25, 119(1952).
${}_{4}\mathrm{Be}_{4}^{8}$	$Li^{7}(p,\gamma)$ Resonant γ's isotropic, non-resonant anisotropic	H. Nabholz et al., Helv. Phys. Acta 25, 153(1952).
${}_{6}\mathrm{C}_{6}^{12}$	Level $Be(\alpha,n)$ γ 4.45 scin	S. A. E. Johansson, Phil. Mag. 43, 249 (1952).
	$\alpha(\theta)$ $N^{14}(d,\alpha)$ for 0 and 4.4 levels	W. M. Gibson, E. E. Thomas, Proc. Roy. Soc. (London) 210(A), 543(1952).
${}_{7}\mathrm{N}_{7}^{14}$	$C^{13}(p,\gamma)$ Levels Γ(kev) 8.05 32.5 8.62 6 8.70 500 9.18 2.1 9.49 45	J. D. Seagrave, Phys. Rev. 85, 197(1952).
	$d(\theta)$ $N(d,d)$	W. M. Gibson, E. E. Thomas, Proc. Roy. Soc. (London) 210(A), 543(1952).
${}_{8}\mathrm{O}_{9}^{17}$	$\sigma_s(\theta)$ $O^{16}(n,n)$ Level Γ J 5.94 $p_{1/2}$ 6.36 0.18 $s_{1/2}$ 7.28 0.22 $d_{3/2}$ 7.73 0.80 $p_{3/2}$ 8.29 0.28 $p_{1/2}$	E. Baldinger et al., Phys. Rev. 84, 1058 (1951); Helv. Phys. Acta 25, 142(1952).
${}_{12}\mathrm{Mg}_{13}^{25}$	New levels $Al^{27}(d,\alpha)$ 3.96, 4.12, 6.98, 7.85, 8.62, 9.06, 9.75, 10.78, 11.89 ppl	E. C. Toops et al., Phys. Rev. 85, 280 (1952).
${}_{15}\mathrm{P}_{15}^{30}$	Levels $Si^{29}(d,n)$ 0.75, 1.46, 2.00 ppl	C. E. Mandeville et al., Phys. Rev. 85, 193(1952).
${}_{15}\mathrm{P}_{16}^{31}$	Levels $Si^{30}(d,n)$ 0.33, 1.19, 2.22, 3.41 ppl	C. E. Mandeville et al., Phys. Rev. 85, 193(1952).
${}_{15}\mathrm{P}_{17}^{32}$	β^- 1.704 sl Bump at $H\rho \sim 1000$ not found by S(d) or P(n)	E. N. Jensen et al., Phys. Rev. 85, 112 (1952).
${}_{15}\mathrm{P}_{18}^{33}$	τ 24.8^{d} β^- 0.26 sl	E. N. Jensen et al., Phys. Rev. 85, 112 (1952). S(n,p); S(γ,p).
S	Variation in terrestrial S^{32}/S^{34} ratio Same ratio for igneous and meteoritic samples	J. Macnamara et al., Can. J. Chem. 30, 73(1952).
${}_{18}\mathrm{A}_{18}^{36}$	$A^{40}/A^{36} \left\{\dfrac{\text{inner earth}}{\text{atmospheric}}\right\} > 1$	G. Boato, Nuovo cimento 9, 44(1952).
${}_{32}\mathrm{Ge}_{45}^{77}$ 59^{s}	γ 0.380 scin	A. C. G. Mitchell, A. B. Smith, Phys. Rev. 85, 153(1952). Ge(slow n).
${}_{32}\mathrm{Ge}_{45}^{77}$ 12^{h}	β^- 2.2 complex s γ 0.263 s	A. C. G. Mitchell, A. B. Smith, Phys. Rev. 85, 153(1952).
${}_{33}\mathrm{As}_{38}^{71}$	τ $\sim 50^{h}$	D. F. Bracher, A. R. Crathorn, Nature 169, 364(1952). Ge(d,n); ms.
${}_{37}\mathrm{Rb}_{48}^{85}$	$\Delta\nu(Rb^{87})/\Delta\nu(Rb^{85}) = 2.251413 \pm 0.000005$ M	S. A. Ochs, P. Kusch, Phys. Rev. 85, 145 (1952).
${}_{38}\mathrm{Sr}_{47}^{85}$ 65^{d}	γ 0.514 s;ce⁻,pe⁻ $\alpha_K = 0.007$, $K/L \sim 12$ $\tau > 1^{\mu s}$ No e^- with $0.12 < E < 0.2$ $X/\gamma \sim 1$	W. S. Emmerich, J. D. Kurbatov, Phys. Rev. 85, 149 (1952).
${}_{47}\mathrm{Ag}_{63}^{110}$	γ (0.656) sl;ce⁻ $K/L = 14$	W. C. Kelly, Phys. Rev. 85, 101(1952).
${}_{48}\mathrm{Cd}_{61}^{109}$	γ 0.087 sl;ce⁻ (39^{s}Ag) $\alpha_K \sim 6$ $K/L = 0.75$	O. Huber et al., Helv. Phys. Acta 25, 3 (1952). Ag(p,n).
${}_{49}\mathrm{In}_{62}^{111}$	γ α_K K/L 0.173 0.104 6.6 0.247 0.054 5.3	O. Huber et al., Helv. Phys. Acta 25, 3 (1952). Cd(p,n).
${}_{49}\mathrm{In}_{65}^{114}$	γ 0.192 sl;ce⁻ $K/L = 0.96$	O. Huber et al., Helv. Phys. Acta 25, 3 (1952). Cd(p,n).
${}_{49}\mathrm{In}_{65}^{114}$ 50^{d}	γ (0.192) sl;ce⁻ $K/L = 1.30$	W. C. Kelly, Phys. Rev. 85, 101(1952).

$_{50}Sn^{124}_{74}$	τ(double β decay) $>1.7 \times 10^{17y}$		M. I. Kalkstein, W. F. Libby, Phys. Rev. 85, 368(1952).
$_{53}I^{131}_{78}$	β^- 1* 0.246 2* 0.328 γ 0.638 0.720	a$\beta\gamma$ scin	P. E. Cavanagh, Phil. Mag. 43, 221 (1952). *Relative intensities.
$_{56}Ba^{137}_{81}$ 2.60^m	γ (0.662) K/L = 4.57	sl;ce$^-$	W. C. Kelly, Phys. Rev. 85, 101(1952).
$_{58}Ce^{144}_{86}$	γ (0.132) K/L = 5.3	sl;ce$^-$	W. C. Kelley, Phys. Rev. 85, 101(1952);
$_{59}Pr^{140}_{81}$	β^+ 2.23 γ/K X-ray $<10\%$ β^+/K ~ 1.6 assuming K capt/L capt = 7	sπ $\sqrt{2}$	C. I. Browne et al., Phys. Rev. 85, 146 (1952). Pr(19 Mev d)$Nd^{140} \rightarrow Pr^{140}$; ion chem.
$_{60}Nd^{140}_{80}$	$E_{dis} \sim 0.1$, K capt/L capt = 2.8 from K X-ray intensities in $Nd^{140} \rightarrow Pr^{140} \rightarrow Ce^{140}$		C. I. Browne et al., Phys. Rev. 85, 146 (1952). Pr(19 Mev d); ion chem.
$_{65}Tb^{160}_{95}$	γ 0.085 $\alpha_K = 1.6$	scin E2	F. K. McGowan, Phys. Rev. 85, 151(1952).
$_{66}Dy^{165}_{99}$	γ 0.095 $\alpha_K \leq 2.9$	scin	F. K. McGowan, Phys. Rev. 85, 151(1952).
$_{67}Ho^{166}_{99}$	γ 0.081 $\alpha_K = 1.9$	scin E2	F. K. McGowan, Phys. Rev. 85, 151(1952).
$_{69}Tm^{170}_{101}$	γ 0.085 $\alpha_K = 1.5$	scin E2	F. K. McGowan, Phys. Rev. 85, 151 (1952).
$_{71}Lu^{177}_{106}$	γ 0.112 $\alpha_K = 0.81$ $\tau < 5 \times 10^{-10s}$ 0.206 $\alpha_K = 0.04$ 4.5% 0.318 $\gamma\gamma(\theta)$ b = −0.213	scin E2 E1	F. K. McGowan et al., Phys. Rev. 85, 152(1952).
$_{79}Au^{198}_{119}$	γ 0.411 $\alpha_K = 2.75 \times 10^{-2}$ K/L = 2.2 No ce$^-$ with E <0.328	sl;ce$^-$	O. Huber et al., Helv. Phys. Acta 25, 3 (1952).
$_{80}Hg^{197}_{117}$ 25^h	γ 0.1343 K/L <0.1 (Hg) 0.1654 K/L ~ 0.25 (Hg)	sπ;ce$^-$	J. M. Cork et al., Phys. Rev. 85, 386 (1952). Hg(pile n).
$_{80}Hg^{197}_{117}$ 65^h	τ 66.4^h γ 0.0776 0.1914 K/L ~ 9	sπ;ce$^-$ (Au)	J. M. Cork et al., Phys. Rev. 85, 386 (1952). Hg(pile n).
$_{80}Hg^{203}_{123}$	τ 47.9^d γ 0.2795 K/L ~ 10	sπ;ce	J. M. Cork et al., Phys. Rev. 85, 386 (1952). Hg(pile n).
$_{89}Ac^{228}_{139}$	β^- ~ 1 1.6 1.8 2.16	sπ	C. G. Campbell et al., Phil. Mag. 42, 126(1952).
$_{92}U^{234}_{142}$	γ 35% 0.055	ppl	J. Teillac, Compt. rend. 230, 1056 (1950).
$_{92}U^{238}_{146}$	γ 24% ~ 0.050	ppl	G. Albouy, J. Teillac, Compt. rend. 234, 829(1952).
	γ 23% 0.048	ppl	B. Zajac, Phil. Mag. 42, 264(1952).
$_{93}Np^{235}_{142}$	τ 410^d K $<10\%$ L $>90\%$	pc	R. A. James et al., Phys. Rev. 85, 369 (1952). U^{235}(20 Mev d,2n).

Q's Between Ground States

$H^2(d,n)He^3$	3.24 ± 0.04	H. Bichsel et al., Helv. Phys. Acta 25, 119 (1952).
$B^{10}(n,\alpha)Li^7$	2.78 ± 0.02	
$Si^{28}(d,n)P^{29}$	0.29 ± 0.04	C. E. Mandeville et al., Phys. Rev. 85, 193 (1952).
$Si^{29}(d,n)P^{30}$	3.27 ± 0.04	
$Si^{30}(d,n)P^{31}$	4.92 ± 0.04	
$P^{32}(d,n)S^{32}$	6.81 ± 0.08	F. A. El-Bedewi et al., Nature 169, 235(1952).

AEC, Oak Ridge, Tenn.,-W15920

AVAILABILITY OF AEC RESEARCH AND DEVELOPMENT REPORTS

The Reports Reference List indicates the declassified and unclassified research reports which are abstracted in this issue of Nuclear Science Abstracts.

Many of these reports are or will be published in the scientific and technical journals or in volumes of the National Nuclear Energy Series. Upon publication, the report is listed in the supplements to the Numerical Index of Reports, found in the back of each issue of Nuclear Science Abstracts.

Reports not intended for publication are sent to the AEC depository libraries listed below as soon as possible after being abstracted. (Some of this group are also for sale by the Office of Technical Services, Department of Commerce, Washington 25, D. C., which will send price lists upon request.)

HOW TO LOCATE AEC REPORTS

If the AEC report number is known, the searcher should go directly to the cumulative Numerical Index of AEC Reports in Nuclear Science Abstracts, Volume 5, No. 24, Dec. 31, 1951, or, for recent reports, to the supplements to this index in each issue beginning with Volume 6, No. 1 (Jan. 15, 1952). The Numerical Index of Reports includes a complete list of AEC reports, by number, giving the related abstract number and (where applicable) the journal reference, the National Nuclear Energy Series citation, or the availability through the Office of Technical Services. (Where no indication of availability is given, the report is or will be found at the depository libraries.)

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More complete information is given in a pamphlet, "Availability of USAEC Research and Development Reports," which may be obtained upon request from the Technical Information Service, U. S. Atomic Energy Commission, P. O. Box 62, Oak Ridge, Tennessee.

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